

AVIATION WEEK

A McGRAW-HILL PUBLICATION

MARCH 21, 1955

50 CENTS



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B. F. Goodrich's celluloid and less a rubberized drygloss that runs inside a U shaped seal adds to her inflated, the elongated, supple film can't be easily to make an air-tight seal. In a word, it's paper thin. Drygloss stretching film blowing up a balloon; a classroom.

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Supersonic Super Mystery Starts Test Program

Douglas' new fighter prototype, Model D-558-1, code-named the Super Mystery, reached the speed of sound in level flight on its fourth test flight, made the day after its first takeoff May 2. The new French fighter is the first of a series now entering production

at the facilities of Aeronavale-Douglas. Prototype is powered by British Rolls-Royce R.A.18 Avon, rated at 5,000 lb. static thrust; two B2 production models will have the French SNECMA Atar 10RJ rocket incorporating an afterburner

Domestic

Labor dispute between two unions and the International Association of Machinists (IAM) was settled last week after nearly a year's negotiation. The new contract was signed by United National Truck World, Northwest and Central Airlines Eastern Air Lines, who involved in the dispute, related to settle the pact. The agreement covers about 14,000 employees until Oct. 1, 1956, and involves wage increases ranging from \$1 to \$7 a week on base—a combined total of \$2,397,000 annually.

Radioluay new aircraft project, developed to withstand terrific self-inflicting fuel tank, is an production for Navy's Bureau of Ordnance at Armstrong Cork Co., Lancaster, Pa., developer of the weapon. Shell is hollow and rated at 160,000 rpm to punch hole in tank and guide explosive. Named "Clastic Carter" by the Navy, it also will be delivered to Army under a production contract with Harvey Metal Casting Co.

Nuclear-powered aircraft design studies will be made by Curtiss-Wright Corp., Wood-Ridge, N. J., under a USAF contract.

One-man supersonic fighter proposals, controlled by the "secret status," and listed by major bureaus a stand-on platform, have been submitted to the Navy. Dr. Lockheed, Philco-Ford, Inc., Mt. Vernon, N. Y., has made 163 flights with its D-558-1 Hélic-Ventor. An unclassified proposal has been submitted a second proposal.

The new union would provide flexible capital structure and obtain funds for acquisition of IAM's present 5% cumulative preferred stock.

United Air Lines reports net earnings of \$9,617,694 for 1954, a 65% gain over the previous year. Total assets as of Dec. 31, 1954, were \$39,875,192 and total cash and cash equivalents as of Dec. 31, 1954, were \$200,719. Operating revenues totaled \$200,719,000, trapping \$200 million for the first time and exceeding 16% since 1953. Operating expenses were \$179,813,242, also 16% higher than last year.

Trans-Canada Air Lines had a net income of \$496,148 in 1954, its fourth straight year of profitable operation. Net for 1953 was \$276,232. Operating revenues totaled \$68,794,252, compared with \$67,316,361 the previous year. Operating expenses amounted to \$67,755,512, increasing from \$64,453,780.

International

Brazil Battalions Mr. Bobb met a senior official between London and Johannesburg, South Africa, before setting out to the Far East. During the flight he made the acquaintance of the 1st Lt. de Resende, Commandant and assistant chief of staff of the 14th Air Force under Maj. Gen. Cleon Chinn, assault died May 10 in San Antonio, Texas.

Financial

United Aircraft Corp., East Hartford, Conn., will seek stockholders at the Aug. 26 meeting to approve an increase in common shares from 45 million to 75 million, each with a par value of \$1. UAC also will propose authorization of 500,000 shares at a par value of \$100

Sugg Sales, Ltd., has been formed in Britain by Sir Alan Arnold Co. and W.G. Sugg & Co., Ltd., to market the U.S. firm's 60-hp Mississ.



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The Aviation Week

March 21, 1955

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GRUMMAN S2F-1 anti-submarine aircraft shows its dive plane gear in operational position. A Major Airframe Division broad interest from the boomer and a Goodwin sprague exhaust, with flow stabilizers to reduce turbulence, is under fuselage. MND-base detects and houses air molecules, the radio static and transponder results. Soundmeters are ejected from the engine nacelles.

New Hunters, Transport

MARTIN XM4M-1 SEAMASTER undergoes a strenuous workload made in hangar at Baltimore, Md., to prove the strength of the orbiter under simulated high-speed flight conditions. Wings of the big four-jet flying boat have been subjected to applied loads of about 700,000 lb. First flight of the new plane is scheduled for this spring.

LOCKHEED C-130A HERCULES first production lot at Marietta, Ga., rolled out the first transport March 10. Plans for first crew of C-130As on the plane. Hercules is a U.S.A.F. medium medium transport powered by four 3,750-hp. Allison T38 turboprop.



INDUSTRY OBSERVER

► Northrop Aircraft's next model in the Scorpion series—the F-89B—is the first nose-carrying aircraft designed to become operational with the Air Force. Kit subcontractors have been informed that through the sub-contract, Textron Inc. has been awarded (AW, Feb. 26, p. 113) to fabricate the F-89B at its F-89D with missile capability. The H model is undergoing flight tests at Edwards AFB, Calif., in addition to the D model with the H missile pod which is undergoing flight tests there. Plans are scheduled to be on the final assembly line about mid-April. One of the wings is being converted onto a H. Plans are being considered to increase the power of the H by switching to an afterburner version of another production jet engine. The version of the plane now in is the status of a proposal to the Air Force.

► Folland Major lightweight fighter has completed 65 hr of flight testing with 14 pilots. It is being fitted with a wing having tactical features similar to those of the Curtiss P-40 for revised flight testing in April. First Curtiss is due to fly with the Bristol Orpheus engine this summer.

► Cessna concepts of Prowler and similar aircraft can now be made disappear through a Ground Control Corp. development. Stories passed just as it is about to start on the program 100% of all drawings of the various new versions due to continue at the original dimension. Full-scale concepts of Pies 51 have been made by this process. Tests on General Aviation's Gullie have started the half-scale stage thus far. Present aircraft concepts are made shriveling through use of such-and-sothing as an automatic safety plan. New Goodrich development permits use of a single piece of Prowler, winds up without filer.

► Douglas-developed Skydol-900, low temperature version of synthetic fire-resistant commercial hydraulic fluid, probably will fly first in British Britannia for British Overseas Airways Corp. British carrier probably will carry over the application to the DC-7i it is scheduled to get. Fluid was developed about a year and half ago at the recommendation of USAF, and was found satisfactory but never used.

► Future versions planned for Lockheed F-104 include configurations for reposition transits as well as all-weather versions with capability of carrying two-pass crew.

► Second production British Britannia turboprop transport has made its first flight and passed the prototype and first production model in an intensive flight development program.

► Buffeting set up by the big attributable belly radius on the Grumman S2F submarine hunter-killer has been eliminated by installing raised ribs on the radome to break up the airflow (see picture, p. 5). Convair Aircraft Corp. makes the glass plastic radome.

► Douglas F4D-1 Skyray, Navy interceptor, is scheduled to begin its carrier trials in about a month. Aircraft first flew in January, 1951, since it is powered by a Pratt & Whitney Aircraft J35-P-2 engine.

► Fairchild is developing a medium-thrust turboprop, smaller than the Atar. Some tests of its new engine were made a few months ago.

► Military aircraft long been impeded with the silencing job done by Convair with the help of an engineering group from Massachusetts Institute of Technology on a modified version of the Convair 340 transport. Among other features the new Model 340 has a squared nose. It will gross 18,000 lb more than current version and add 35 mph to maximum speed in addition to the silencing feature. CAA certification tests are scheduled for June.

► Canopus Division of General Dynamics Corp. has organized an atomic division to explore industrial applications of nuclear power and its Ft. Worth aircraft plant. The new atomic facility is separate from the work now being done at Ft. Worth on a nuclear-powered aircraft.

WHO'S WHERE

In the Front Office

► Howard Webster, Inc. has been appointed an independent council member of Boeing's Air Registration Board.

► Ernst Van Beek has become president of Trading Company Avro-Douglas N.V., Rijswijk, The Netherlands, replacing Gilbert C. Vroom.

► Robert W. Stoddard has moved up to president of Wyvern Controls Co., Worcester, Mass., succeeding Harry E. Stoddard, new chairman of the board.

► F. Melville has been elected vice president and general manager of American Airlines' cargo subsidiary and president of American Airfreight. He succeeds George C. Van Nostrand, who has become vice president-president and managing officer of the parent company.

► Harold R. Barnes, vice president of Stevens Industries, Inc., Canonsburg, Pa., has taken over the firm's Eastern and Western Divisions as general manager.

Changes

► Walter M. Fiedling, designer and builder of the first U.S. heavy bombers and president of the parent Stiklor Aircraft, Inc., has retired from the company. He is succeeded in management of the Ft. Worth plant by John W. Shuler.

► Guy W. Shuler has been appointed general manager of General Electric Co.'s small aircraft engine department at Lynn, Mass.

► Donald G. Ross, former missile project engineer for Republic Aviation Corp. Products Group, has joined CFC Control Systems, Inc., Herndon, Va., as general manager of the new Aerostar Division.

► Raymond C. Mayhew, chief engineer of Chance-Vought Aircraft, Inc., has assumed responsibility for the Dallas company's aircraft engine operations.

► Frank W. Moore, chief of Air Materiel Command's testbed unit at Wright-Patterson AFB during the Korean War, has become general counsel for Pacific Aerospace Corp., Seattle, Wash.

► Fred V. Howard has joined General Electric Co., Milwaukee, Wis., as sales manager.

► Max J. Black has been appointed sales manager of Royal Aircraft Corp., Montreal, Quebec, by Sir Kenney & Trotter Corp.

► A. M. Davis, formerly director of procurement programs for A. V. Roe Canada Ltd., has joined Macmillan Aircraft Co., Farnborough Division, Via Napoli, Calif., as chief engineer supervisor.

Honors and Elections

► Dr. Leon G. Dens, associate director of Dow-Walkers, Corp., Cleveland, Ohio, has won an Army Certificate of Appreciation for development work involving "knowledge of a research test article into the Compton gamma ray source."

► Carl G. Yester, manager of General Electric Co. Co. II Flight Test Center at Schenectady, N.Y., has been appointed technical committee chairman of the National Aero. Soc. Aero. Eng.



Excellence groups and pessimistic starters are being supplied by Hamilton Standard for such outstanding new jet aircraft as the Navy's Grumman DDF-8 Tiger. Years of pioneering aviation experience, the highest engineering skills and unsurpassed modern facilities lie behind these names and parts, and other fine items of aeronautical equipment which Hamilton Standard is producing for 38 different types of turbine-powered aircraft.



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Washington Roundup

ARDC Shift to Dayton?

USAF Secretary Harold Talbott is making no secret of his preference to move ARDC headquarters from its present quarters in the Pentagon, Wash., to Wright-Patterson AFB, Dayton, Ohio. As Major General Commandant, USAF Headquarters, Strategic USAF commander, with Cambridge, Mass., and Andrews AFB, Md., (where ARDC was originally scheduled to move) the undersecretary, Pentagon insiders are letting it, Talbott's choice of Dayton will prevail. Observers who have followed the long and bitter ARDC-AMC battle believe the Talbott-sponsored move to Dayton could easily be the first step in submerging the research and development effort to AMC control.

Federal Airport Program

Comprehensive construction of the \$11-billion Fleet 1985 federal airport aid program is expected to involve the following major projects:

- **Site of the program.** The \$11 billion program is early in its planning, initially will accomplish little, since it is the new airport for the Washington area which is about \$25 billion alone. Congressional pressure is expected to increase the size of the program over its initial local spending.

- **Two-airport authorizations.** Local authorities concerned with moving marching bands to adjacent federal aid sites will use the joint vice-versa basis of the program and want it to stick to two-on-one interchanges made to that end for public transit programming.

- **Rehabilitation of terminal buildings.** Project program includes use of federal funds for terminal buildings and requires it to remove tight land, etc. Congressional feeling is that terminal buildings are legitimate part of airport operations and should be available to federal aid.
- **Scope of programs.** There will be considerable discussion of whether the present standards for including no ports in program are adequate to meet modern needs.

Lower Military Mail Rates?

Civil Aviation Board is seriously considering lower mail rates for international movements of military mail than for civilian mail. They have the same priority. Military mail moves in very large shipments and is concentrated in the high-density routes so that the cost of performing the service is reasonably low, Irving Roth, chief of CAB's Rate Division, explained to the House Appropriations Committee.

Pentagon Changes

New fires continue to jolt the Pentagon civilian structure, while the main war management bureaus have been disbanded or merged in three plus fiscal year. Exports arm of Defense Secretary Charles E. Wilson and Arms Services Board Services have not developed and Wilson still insists there is no ground for the merger.

Meanwhile, Robert T. Ross, former New York congressman, has been sworn in as Assistant Secretary of Defense for Legislative and Public Affairs, replacing Fred A. Spector, who has been moved to the White House to give his counsel in more important cycles. Spector is spoken of as a top-ranking possibility to become

new chairman of the Republican National Committee. At a lower level and of lesser import to the system industry, with the appointment of Jerome D. Festor, former assistant vice president in charge of industrial relations, from the old Armed Forces Security Agency's new Industrial Financial Security Review Program of the Department of Defense. An attorney, Festor will be in charge of the new central training program set up by Wilson to speed clearance and reduce the number of cases forced into hearing.

Defense Cataloging

Completion of Defense Department's much-anticipated catalog of items bought by the armed forces is in sight. The task has been under way since 1945, will be done by 4,500,000 items total by the services to about 2,500,000. Examples: 800 types of space devices were cut to less than 100; 8,000 types of radio and electronic tubes were reduced to a standard 700.

Navigation Aid Snarl

Despite over military Tenant or civil VOR/DME as the common civil military system for short range navigation has been clouded by excessive claims for DME in veterans' and nonmembers of allied Tenant costs (See p. 77).

Total cost of VOR/DME may approach \$300 million but some less than 30% of that amount represents civil military investment in VOR, reference equipment which will be used for another 10 years. The balance was expended on VOR ground installations, except for option which \$20 million spent by GAA for 215 DME ground units and private purchases of 80 additional DME.

ANDRIS' decision to push development of Tenant for eventual adoption as the common system with a 10-year phase out of VOR was intended to get full value out of VOR. The immediate sacrifice of distance determination, letting DME as well as VOR was considered by ANDRIS "the cheaper price to pay in order to get the common quota back on the track."

Carrier: Low Vulnerability?

Opposition to carrier aviation has been generated "without the Department of Defense" and "has been carried on without the aid, assistance, or support of the military departments concerned," House Armed Services Committee declares. Its report says this point out:

- A carrier task force which can be spread out over an area of 31,000 sq mi., approximately the size of Indiana, "obviously does not present a profitable target to an air weapon system of the type we have here."

This is further emphasized by the fact that the task force is always moving and thereby can avoid most weapons effects of thermal-energy weapons.

- In the tracked system against France where "no fixed radars are... located," the importance of having one carrier force move into the threatened area to reduce survival policy "was readily apparent to all."

- Although Russia has a group of 1,000 naval aircraft, there is no information concerning their living or building targets. "We should continue to exploit this weakness of the Soviet Navy in continued development of our own antisubmarine force," the report states.

—Washington staff

in the air...

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FAIRCHILD TRACKS. After down Boeing B-57s as demonstrators of its effectiveness of the USAF's newest air-to-air missile.



Operational Missiles Now Arming USAF

Scientific achievements spur program of Atlas; IBM; Falcon proves successful as a defensive weapon.

By Robert Hetsch

Guided missiles program of the U.S. Air Force has reached a successful developmental stage and is making progress toward the production of operational missiles for both offensive and defensive use as a result of major scientific achievements by the aircraft industry and its research programs.

These developments are:

- **Packaging atomic warheads** was born. Development of small, lightweight atomic warheads with high destructive yields equivalent to early bulky bombs has been a major resolution for the missile battalions. New missile objectives in the weight and size of hydrogen warheads promise to simplify both guidance and propulsion problems for intercontinental missiles. For every pound of weight reduction in the missile workload approximately 300 lb of fuel can be saved as an incremental increase in range. The use of a hydrogen warhead will reduce the earlier accuracy requirements for precise missile guidance to the target.

- **Re-entry problem.** Although details of this most numerous missile added by military security the most difficult

part of this problem for ballistic-type missiles has been surmounted and promising solutions are in sight. The problem was that the ballistic missile on re-entering the earth's atmosphere at hypersonic speeds generates sufficient heat from skin friction to melt the nose cone. This was overcome by the use of a carbon V-girt covering at only 1,000° F., which is far below the melting point of aluminum.

• **Guidance.** Major developments in celestial guidance equipment have made this method feasible for long range guidance of intercontinental missiles.

- **Powerplant.** Recent progress in both rocket and ramjet powerplants now make it possible to drive large missiles at the hypersonic speeds required for long range operations.

- **Finishing USAF missile projects in time.**

Atlas

The Atlas SM-65 intercontinental ballistic missile (AVW Mar. 7, p. 22) is one well under way in one of the most important development programs ever to be led by USAF and the missile industry. It is designed to explode a hydrogen bomb warhead on enemy targets 3,000 mi. from the launching point,

tank and provide the warhead as well.

• **North American Aviation Inc.** The firm will make the 132,000 lb thrust liquid-fueled rocket that will be used in the first stage of Atlas program. North American has also built the second stage rocket motor, but Bell Aircraft Corp. and Aeromet-General Corp. are also competitors for the production job.

• **General Electric Co.** Guidance system for the Atlas will be developed and built by GE.

• **Eero-Worlidge.** This firm currently has a \$7 million contract for developing minimum technical proposals for the Atlas program but also will probably get the contract to design and build the nose section which is critical to the problem of preventing the atmosphere from the way to the target. Ramo-Worlidge also has been considered in overall manager of the Atlas program under the weapon system concept under supervision of Air Research and Development Command's Western Development Division.

Conversely, the one in the Atlas program will be strengthened by the addition of Dr. Fredrik de Hallwax, nuclear physicist and former deputy to Dr. Edward Teller at Los Alamos Scientific Laboratory and appointment of a scientific advisory group headed by a distinguished group of experts.

• **USAF-Cessna-Crossair's** encouraging effort on the Atlas project has been strongly criticized by USAF for lack of sufficient talent, revised on scientific weapons, liquid-propellant aerodynamics, high-altitude physics and missile guidance problems. This criticism played an important role in diminishing Convair's original role in prime weapons system contractor for Atlas to one of several major contractors in the program. It also resulted in USAF bringing the

missile development group into the Atlas project.

Among the top issues on the new Convair advisory group are:

- Dr. Theodore von Karman, pioneer in aerospace aerodynamics.
- Dr. Hans Bethe, atomic and hydrogen bomb physics.
- Dr. Edward Teller, hydrogen bomb expert and associate director of the University of California Radiation and Livermore Laboratories.

This big star-studded scientific panel in the Atlas program has been a great solution to the reentry problem when the missile comes plunging back into the earth's atmosphere at speeds that produce heat from skin friction.

Although the previous method of



DEAD CENTER! Falcon Mists up through Boeing B-57 door for direct hit.

by military security, there are several generally known approaches to the problem. These are:

- **Slowdown.** By slowing the speed of the missile the skin friction is reduced by a factor of 30. The rate is slowed to 75%. One method considered to slow the missile is to break it up into several chunks on re-entry and allow the missile to float down separately. With a hydrogen warhead, the economy lost by this operation would not be serious. Mechanical stress holes could also be used, similar to dive holes on an aircraft, to drop holes on an missile at drag status. These divers could cut off or melt during the descent but would still allow the missile to penetrate speeds.

- **Burnaway.** The method calls for utilizing successive layers of heat-resistant materials so that each layer that burns away will keep the friction-generated skin heat from the next outer shell until it is saturated.

- **High altitude explosives.** This method would explode the warhead above the atmosphere before the missile made its reentry. With a hydrogen warhead that might be effective.

Falcon

First official details on the Hughes Aircraft Falcon (GAR-9) surface-to-air missile were released by Taylor Gordan, USAF Assistant Secretary for Research and Development, in "Speech at the USAF Institute of Technology." Gordan said the Falcon was "one of the most important contributions to the defense of the North American continent since the development of radar." He revealed that the Falcon is an production at Hughes Aircraft's Torrance,



HIGHLY POUCHED Falcon at its full length, can be handled easily by two technicians.

Asia, plant and will soon be installed operationally in USAF interceptors (See p. 15).

The Falcon weighs 3,000 lbs. It travels at supersonic speed and carries a nuclear warhead and electronic equipment that makes it an elusive target. It is 6 ft long and 6 inches in diameter.

► **F10** Is a KF-The Falcon has been successfully test-fired from the ground and from the Convair F-102 delta-wing interceptor in the air at GBU-17 bombs and F-86 jet drivers. The Falcons knocked down three flying targets at Holloman AFB, N.M., sans without using an explosive warhead.

Falcons fire using an explosive warhead that usually sets off a 100 lb. charge.

Falcons is driven by a midrange-photon rocket that pushes over 6,000 lbs thrust and gets a load of about 60 lbs on the missile at the time of launching. The fact that the Falcons scores good on without the shock and jolt factor necessarily afterward indicates a major advance in rugged construction for this type equipment.

Thomas Hughes, owner of Hughes Aircraft, and the Falcons trading and licensing system gear control unprecedeted problems in design engineering and development.

For example, he said, "the manufacture of components was necessary to an extent to which would be necessary if you compromised two microwave acts unto the size of a football."

► **Advanced Versions**-The Convair F-102 and the Northrop F-9F8 will be the first operational aircraft to use the Falcons as a weapon in the air defense



CONVAIR F-102A will be a Falcon carrier, taking up to six of the missiles.

system of the North American company.

Originally it was a General Electric Co product known as Doghouse but was dropped to GE in the early phase and substituted by USAF with Hughes fire after 1954 all-weather interceptors can perhaps that preceded the F-102.

Snark

The Northrop Snark SM62 is the first long range USAF missile to reach the flight test stage. It is now being flown at the Long Range Missile Test Center with launching at Cape Canaveral, Fla. Snark is a ram-air-turbojet propelled missile with a range of 3,000 miles at supersonic speed. It is now powered by an Allison J31 aircraft jet engine, but later versions will use the Pratt & Whitney J77 axial turbojet. The early Snarks were an experimental flight test, a solid design with a long narrow chord wing swept high 45 deg. Constant chord control surfaces are used on wing and vertical tail. Wingspan is about 30 ft with a leading edge slant of about 30 ft. Vertical tail is swept to match the wings and is high with a narrow chord.

► **Goldstone-Snark** is developed from the Northrop all-ram-air-turbojet-powered missile (AFW 57-2, 1957, p. 26) by means of lengthening with solid propellant rocket boosters.

After initial climb to cruising altitude it attains a cruising speed of Mach .9 and converges to a combination of celestial and inertial guidance. This is probably a star-tracking telescope superimposing intelligence in a central computer plus interpolator. The auto pilot should establish the initial course and simply sets off during cruise and then cut back in again during descent (less the telescope would have trouble locking onto its selected star) as it comes when clouds obscure the star being tracked.

The Snark will be expected to carry a nuclear warhead. It was designed for a subset of a top-level USAF database used at Loring the program because of the missile's slow speed while penetrating enemy defenses. Snark is considered too easy a prey for anti-aircraft

missiles or enemy interceptors but the program is being continued with low development of the angular Snark design.

Nashua

North American Aviation's Nashua SM64 is a solid powered missile also known as ANAS. It is intermediate range and launching at about Mach .75 at an altitude of 75,000 ft. Nashua's software has been flight tested using nuclear power at Edwards AFB, Calif., and the results scheduled to power it also have been in a special test vehicle registering successful performance up to Mach .3 and 90,000 ft. Intermediate Nashua will use a celestial guidance system and is also designed for hydrogen bomb war heads.

Rascal

The Bell Rascal GAM63 is very close to being an operational missile.

British Missile Details Revealed

Anti-aircraft types nearing production; hints dropped regarding BHM prospects; 1,500 missiles tested.

Many new details of the British guided missile programs have been revealed in a recent article by the chief commander of the Royal Naval Fleet Air Arm, London. The full lesson extracts provide information on specific British missile projects and the scope of the program.

Britain's guided missile program is by no means negligible. In the Armstrong-Spartan White Paper on Defense status that production orders have so far been placed for one type of guided missile to be carried by fighter aircraft. Ringtons are already being equipped with special (Elois) radio "tail" whisks calculate their distance from the target which a guided missile can hit most effectively. A series of such electronic hunting devices have been developed, most of which depend on the use of photodiodes which are especially sensitive to the radio end sub-generators driven by the heat of the engine gases. They can sense the presence of comparatively low heat sources and respond by triggering off a relay circuit which uses the power stored in a small electric battery to operate the missile's navigation controls. Models of this type have been tested over a long period on a number of planes.

► **New Radars**-More than 1,500 guided missiles have been delivered since first off the rocket ranges at Woomera, Australia, and Alcocksort, Wales, and a number of other guided missiles are nearing the production stage. One of these is the surface-to-

air missile, can also be used to detect that final locking of the missile to the launcher or missile detector. Electronic equipment were battery and other components had to be placed in so that each missile, made of which contains ten times as many parts as the average missile set, can be fitted into the launcher.

"Some of Britain's guided missiles, like the V-2 type boost-rocket, have a single location war head which is dropped on to the rear of the liquid-propelled rocket proper during take-off. Others are simple, but others after being initially accelerated to their running speed can travel at speeds from 1,200 mph to 3,000 mph for 100 miles or more." ► **Rocket Programs**-Foster Adkins is developing guided rockets which are entering the production stage as well as experimental radio-controlled vehicles for launching ordinary rockets which also have been provided by solid fuel rocket propellants. One of these can shoot distances at great speeds with the aid of three liquid-hydrogen powered Beta rocket motors.

"The short-range GLIM missiles or solid Naval surface-podded missiles whose development was forensic to the Naval Estimates and the long-range inter-continental rocket capable of traveling 1,000 miles or more, forensic to the Defense White Paper, are primarily weapons intended for delivering nuclear weapons."

With a schedule well advanced on missile land-based long-haul missile racks, of which many is expected to follow, if not exceed, the mass of the German surface-project A-30 and can carry warheads for above the earth's atmosphere, which covers 100 miles up." ► **Guided Air-to-Materials**-Adkins all this development work in which mass than 100 British companies are engaged, has a resolution in the development of new materials capable of withstanding the extreme temperatures of atomic energy and also the development of some sort of control instruments (See America). Nak has 1,500,000 parts and a mass of nonexplosive contents.

"There is also the new role being using a new and more efficient type of radio whisks, with a hundreds of subminiature control units, also covers the whole of the United Kingdom. Located in this area is a further network of electronic instruments such as those covered by the name "photon" or "radio" package through the air. British designs have been developed that will extend and locate small, omnidirectional distance and direction finding devices which are known capable of operating the navigational controls of missiles via amplifying and sub-carriers can detect the scale of phase or amplitudes.

"Monolithic short range radars sets like the Elois radar eye already mentioned, though for smaller, can also be used to detect that final locking of the missile to the launcher or missile detector. Electronic equipment were battery and other components had to be placed in so that each missile, made of which contains ten times as many parts as the average missile set, can be fitted into the launcher.

In the latter case the receiver will set off action pulses which in turn will start the firing devices for these missiles closest to the target within a fraction of a second."

Convair Advisors

Convair has recruited a team of scientific advisers to assist in the development of missile systems and aircraft and to study problems of long duration research. The scientists listed by their qualifications are:

► **Theodore B. Bayes**, De Havilland, president of Physics, Cornell University; Dr. Kenneth M. Cox, associate professor of physics, University of Michigan; Dr. Charles T. Crittenden, professor of plasma, University of Minnesota; Dr. Mark M. Miller, chair of theoretical plasma theory, University of California Lawrence Laboratory; Dr. Edward Teller, professor of physics and associate director of Radiation and Lasertron Laboratories, University of California; Dr. John A. Wheeler, professor of physics, Princeton University.

► **Mechanics and Theory of Metals**; Dr. Robert P. Meld, head of Department of Mechanical Engineering and dean of

Graduate Studies, Carnegie Institute of Technology; Dr. Frederick Soddy, professor of physics and scientific director of Control Systems Laboratories, University of Illinois.

► **Experimental Physics and Electronics**: Dr. Lin Ju Chu, professor of electrical engineering, Massachusetts Institute of Technology.

► **Mathematics and Aerodynamics**: Dr. Theodore von Karman, chairman of the Advisory Group for Aeronautical Research and Development for NAVFAC; Dr. Richard Courant, director of Institute for Mathematics and Mechanics, New York University; Dr. Peter D. Lax, associate professor of mathematics, New York University; Dr. Milton S. Plesset, professor of applied mechanics, California Institute of Technology.

► **Metallurgy and Theory of Metals**; Dr. Robert P. Meld, head of Department of

Navy Blames Engine Builders For Costly Production Delays

Complaints of engine manufacturers who encompass the time needed for development of new jet power units is blamed by U.S. Navy for schedule and unacceptably high costs in its aircraft program.

In a hard-hitting speech, James H. Smith Jr., Assistant Secretary of the Navy for Air, told a preposition meeting of the Institute of Aeronautical Sciences at Cleveland, Ohio, that the industry two years ago of using the "impossibly optimistic plan" to all aircraft.

► Examples of Delays—Comments given to the Navy, Smith said, commonly do not allow for delays in development with the result that much aircraft scheduling is upset at a high cost in dollars and fleet effectiveness.

As a specific example, Smith cited the case of the Chance-Vought F7U and McDonnell FH aircraft cancellation of last fall. These were attributed by the Navy to development delays in the Westinghouse J30 and J46 and Allison J31 engine programs.

Smith said the Navy has an assessment of over \$1 billion in these programs not counting government facilitated expenses.

► Visible Readjustments—"We underestimated the development time by one half and established our production schedules accordingly. Our scheduling would have been just about right if the engines had required only the estimated three years in development but when they actually took twice that long the rest of our program had to go through violent readjustments," he said.

One outcome of the Navy's program has been a statement by Defense Secretary Charles E. Wilson that there have been too many engine developments following this path. Defense Department's first suggestion for a remedy was a proposal that mass standardization be introduced and fewer engines entered through to production.

Problems of this plan, which has brought strong objections from most of the industry and is known to look like anathema to the Navy and Air Force, was the offer of Frank D. Newland, Assistant Secretary of Defense for Applications Engineering. It was apparently written by Frank D. Hague, formerly with the Office of Defense Research and Engineering and now a consultant to Newland.

► Carlisle Delaney-Birk Newland and Hague are former vice presidents of Westinghouse. The former heads a committee set up by Wilson to draft a

new director program engine development which Smith is a member of the group along with Regis Lewis, Assistant Secretary of the Air Force for Materiel.

None of the Defense Department critics, including Smith, Newland and Hague, know much say nothing of the sole flight by Navy's Bureau of Aeronautics in engine procurement. Some industry observers, cognizant of Beyer's responsibility in manager development programs, have felt for a long time that the company is prone to accept exaggerated claims by certain manufacturers, turning down more conservative bid proposals.

So far, Beyer has been silent on the growing controversy over the jet engine situation.

Further details of the F7U-Curtiss situation was outlined last week in Chase Weight's annual report. The F7U version was the company's own production project in 1954.

"From the beginning," the report says, "the Curtiss program has been beset by delays and development problems of the engines which are engine manufacturers in financing for these airplanes." The power unit in the Westinghouse J30 was rated at 4,050 lb thrust.

► Problems in 1958—"During the year 1958 it became apparent that the task of introducing a carrier-based fighter such as the Corsair with the seven hundred-horsepower auxiliary power plant was beyond realization under the schedule offered by the Navy. Accordingly, the program was reduced in June 1958, and two separate schedules simultaneously were effected during the year."

It is expected that the Curtiss and

"industry shares with the government," Secretary Smith asserted, "a responsibility for the overall delay of the project."

► Realistic Planning—"In encouraging that organization it needs to show a more realistic and lessened attitude in planning and designing new aircraft models if we are to achieve results."

The aviator world would seem in the form of profit planning and in the lifting of latest programs based on estimates which the estimator makes but important is at stake, not an ideal long range to build up the backlog, come what may.

"As the engine and airframe development contracts generally call for payment of tools plus a fixed fee, the contractor is committed but not financially sound about his mistakes," the Secretary charged.

"He should be encouraged that an industry closer to the contract might help to attain more contracts than promising what they cannot deliver."

Its engines will be subject to development schedules throughout part of the next 1958, the report says, estimating that more time will be needed to smooth out the money-handled fighter's production program.

On the subject of the cancellation, the report says they resulted in loss of orders for 96 Model AD21 aircraft, the chief version of the Corsair.

► Operations Reduced—"The development and supply," the report states, "by an engine manufacturer of a new and improved engine model required for the Model AD21 aircraft was unacceptable late and therefore the Navy found it necessary to cancel the engine program. No suitable alternative engine was available."

The production program was on roughly scheduled for delivery during the years 1955 and 1958, and the level of operation for those years will be reduced somewhat by the cancellation.

(The infrared base was to another Westinghouse engine, a later version of the J65.)

Smith pulled no punches in drawing an indictment of the contractor's aircraft industry.

► Tougher Policy—"It seems though," he said, "both the engine and aircraft industry were content with the short range view that a big contract in hand on which delivery is steady is better than the offering of a really solid program of a later date."

► In plain words, let's get a big one-time backlog now and sacrifice through the production program later."

Smith made it clear that the Navy's procurement policy is getting tougher on these matters, and a separation for safety to deliver what is promised comes more weight than it has in the past.

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PIASECKI H-21 low-sweeping profile during Navy tests of new helo techniques developed in the helicopter's manifolds.

Navy Will Sweep Mines with Helicopters

Application of the helicopter as an aerial tag to sweep enemy minefields was disclosed last week by the U.S. Navy and Piasecki Helicopter Corp.

The new technique, for which Piasecki claims a trademark design for strategic advantage, practically eliminates the inherent threat of having the lead minesweeping vessel blown up in clearing a harbor full of mines or a cargo vessel.

► Floats Towed—In practice, the helicopter is used to provide continuous and minesweeping stage, clearing the path for the first load of a V-shaped formation.

Piasecki's contract for development of a towing technique goes back three years. The company's engineers have been working with Navy mine countermeasures experts and the experimental station at Pensacola, Fla., on prototype trials in the Gulf of Mexico since November 1952.

Fleet strength was the venerable HRP-1 tandem, same model used by the company as earlier work on anti-submarine warfare with the Douglas Skymaster. An increased towing strength. For minesweeping, Piasecki utilized a special tow bar and hook.

First tests with the HRP-1 proved that the helicopter could operate in fast or conventional minesweeping and so rough that ships could not do the job.

► Advantages—Further towing experiments in 1953, using the newer Piasecki H-21 Wisk Dancer, a more powerful helicopter, eliminated these difficulties.

► The H-21 could pull double sweep gear at six times faster than a minesweeping vessel.

► Maneuverability of the cockpit in relation to the hull was superior to that of the surface vessel.

► Ability to operate from landing platforms or surface ships without them

ability to sweep minesweeping boats.

► The helicopter can produce a towing pull equal to several tons at normal lift capacity, bring in a sweep minesweeping cable.

► The towing cable provides additional stability, making the pilot's job easier than in manual operations.

Both Piasecki and the Navy project development of the towing technique with minesweeping in the future remains still lead to other applications. These include:

► A tag to tow disabled vessels, of



TOWING ATTITUDE of H-21 mine sweeper in nose down to 90° maximum pulling power.



RESCUE OPERATIONS also are demonstrated by H-21, shown here towing Navy PT boat.

ability to both the Navy and the Coast Guard.

► To free bogged land vehicles, such as tanks stuck in the sand on a landing beach, reef, swamp or sand, a site that can be adapted to Marine operations.

According to the company, the HRP-1 has a towing pull of 5,000 to 6,000 lb in tests pulling a loaded truck from the sand. Navy did not release figures on the pull exerted by the H-21, but it carries an 11,000-lb engine in the version used at Panama City.

Army Creates Aviation Division

By Claude White

U.S. Army is the last two months quietly brought about three changes in administrative control over its fast-growing aviation department. All are at Army's taking over complete responsibility for its aircraft program. They are:

- Creation of a new Aviation Bureau in the Office of the Assistant Chief of Staff, Operations (G-3).
- Shift of Maj. Gen. James M. Covas, chief of G-3 and an aggressive proponent of airborne mobility, to a new job as Deputy Chief of Staff for plans and research.
- Relocation of the Army's aviation school at Camp Radcliff, Mo. It now is known as the Army Aviation Center.

Before its elevation, Army aviation was a branch in the Operations and Training Division of G-3. Top officer was Col. Wm. R. Williams, Jr., who now has a new giganc, Brig. Gen. Hamilton H. Howze.

■ Royal Growth—The change removes Army aviation from the jurisdiction of Brig. Gen. L. V. Hightower, chief of operations and training, and puts it on a level with his division and two others, operations and plans.

Aerospace expansion of the new setup is the result of the Army's reorganization, started four years ago with a single officer also formation of an independent U.S. Air Force. In view of the point where steps must be taken to assume program direction and control.

Gen. Green's opportunity to succeed Lt. Gen. Lucas L. Lunsford as Deputy Chief of Staff for Plans and Research follows by only two months a shakeup that uses all Army research and development work placed under the supervision of that office (IAW Inst. 18, p. 14).

■ Logical Step—There was speculation at the time that placing full responsibility for R&D in Lunsford's office was a possible prelude to assumption by the Army of more responsibility over aircraft development and production contracts. Shift of Gen. Green to this job is a logical step in that expansion of Army control.

Well-known as a veteran airborne officer, Covas is a strong backer of the airplane and helicopter as mobile vehicles to move troops and supplies to the battle front. He is the principal figure in pushing Army's program to equip more than 30 helicopters from production companies in the next five years.

There are strong indications that the Army's R&D may be the most important field for activity to make its mobility program a reality.



BRIG. GEN. HOWZE

use of West Point and veteran officers of the cavalry, intelligence and armored branches of the service. His assignment before moving to the Pentagon last month was deputy chief of staff planning for the 1970 fiscal year.

Three former senior groups of Camp Radcliff were disbanded several months ago when the aviation school was moved there from Ft. Sill, Okla. A former tank-type base, Camp Radcliff's facilities are being adapted for aviation work and to house the board responsible for testing new aircraft.

Lobbying Costs AIA \$18,616 During 1954

Aircraft Industries Assoc. total expenditures of \$18,616 during 1954 in connection with legislative activities in its support. Total under the 1956 budget act:

John P. Bishop, former Assistant Secretary of the Navy for Air, made a new registration as representative of the Conference of Local Service Airlines of an annual compensation of \$18,000.

Other expenditures reported for 1954 included:

Howard Beale, Dr. Wm. Rausen and Howard Miller filed individual reports as representatives of AIA. Beale listed an expenditure of \$2,475. Rausen and Miller listed no expenditures. Arne Melby, as representative of E&E Knowhow, Inc., reported no expenditures.

Edward Rodgers and S. C. Tipton also as representatives of Air Transport Assoc. reported an expenditure of \$3,493. Tipton \$125.

John C. Goss, representative of Pan American World Airways, reported no expenditure.

Larry Cato, as representative of Air Line Pilots Assn., reported an expenditure of \$1,23.

Walter Wessels, representative of Commercial Training Society, reported an expenditure of \$14,95.

Douglas Sells 109 Airliners in 60 Days

Douglas Aircraft Co. sold 109 DC-6 and DC-7 transports to 17 buyers during the first two months of 1955. Combined value of the sales totaled more than \$18 million.

The orders increased the company's bimonthly commercial backlog for transports to 259, valued at \$350 million, largest in Douglas history. This mixed total of DC-6 and DC-7 types, including military versions, is \$19.

Transports purchased in January and February were 49 DC-6s and 60 DC-7s, including 18 long-range DC-7Cs.

NIKE: PROOF POSITIVE

NIKE, a tactical air defense weapon that is rapidly being installed by the U.S. Army in and around war and strategic defense areas, has demonstrated the reliability and predictability of rocket power.

Under subcontract to the Douglas Aircraft Company, which is associated with the Western Electric Company, prime contractor on NIKE, Aerjet-General developed the sustainer rocket motor for NIKE and is producing them for Douglas in large quantities.

The largest industrial organization devoted exclusively to the development and production of rocket powerplants, Aerjet-General is applying new, bigger and better rocket power for the Nation's defense program.



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* Hi-Fatigue is a registered trademark.



RAF Shows Off Hunter Units, Hoping To Silence Critics

[McGraw-Hill World News]

London—Royal Air Force officials displayed its three squadrons equipped with Hawker Hunter in an effort to convince British press critics of their military aircraft development and production programs that these supersonic fighters actually are going into service with combat units.

Two of the three squadrons are equipped with the Hunter Mark II, equipped by an American-made engine, while the other has Hunter Mark I, powered by the Rolls-Royce Avon turbojet. Both wings have about 7,700 lb. static thrust without afterburner. Later versions of the Hunter are scheduled to be powered by 18,000-lb. thrust versions of the Avon and Sappho.

► **Gas Gas.**—Carmarthen, Wales engines are experiencing trouble when the four 10-mm Aden cannons fire at altitude (Aviation Week Feb. 14, p. 7). Gas can enter the engine as coolant causing oxygen starvation and flameout. Avon and Sappho. Hunter are also seriously affected by this problem than those using the Sappho.

All Hunters will be modified with cartridge link collectors to catch the spent links as the Aden cannons fire again, since the British fighters are faster than both the North American F-86 Sabre and the Republic F4U-15 fighters, but believe it is inferior to the F-100 Super Sabre now being put into operational service in USAFE. The Sappho and MAG-15 have been operational since 1956 and had two years combat against each other in Korea while Hunter development was lagging in Britain.

demonstrated methods of replacing the detachable pack containing the four Aden cannons (Aviation Week Oct. 4, 1954, p. 11) and refining that enabled them to have a Hunter fly without the pack for 10 minutes. In doing so, the gun pack, complete with breech, ammunition chamber and breech and gun removed complete with handle, ammunition chamber and breech and gun removed. The pack, complete with gun and full ammunition load, weighs 1,908 lb. Each Aden cannon can fire 1,200 rounds per minute.

In an alert and sensible demonstration, 11 Hunter were in the air with pilots in cockpit. Using carbide stoves simultaneously the first Hunter got rolling in 1 mile, 39 sec. with the rest not starting until 15 sec. afterwards. Doctor Hartog got all 11 up in 3 min., 35 sec. One failed to start due to mechanical trouble. In fact, 11 sec. after 11 Hunter were lined up at the end of the runway for takeoff.

Aerojet demonstration had these 12 stop their engines at the end of the runway and the scramble to bleed off. Using carbide starters they were all ready for takeoff within 1 mile, 20 sec. and the first Hunter out of the ground in 2 sec. 5 sec. after the scramble ended. All 12 were in the air within 3 miles, 29 sec.

NACA Construction Wins House Approval

The House passed legislation authorizing an \$8.45-million construction program by National Advisory Committee for Aeronautics after several members pressed the agency.

Authorizations of \$4.85 million for construction of research facilities at the Lewis Flight Propulsion Laboratory is being considered separately to integrate the agency's Atomic Energy Commission's missile program.

NACA's request of \$3.3 million to finance the construction program is pending before the House Appropriations Committee as the 1956 fiscal year budget.

Details of the wind tunnel are:
• Langley Aerostatic Laboratory, \$3,395,000. Installation of an omnidirectional system for the 16-ft transonic tunnel to extend its spanwise range to Mach 3.0, and the addition of the test of large-scale models to determine characteristics of aircraft that become critical at the low supersonic range.

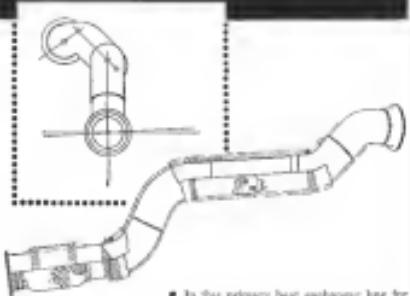
• Ames Aeronautical Laboratory, \$1,035,000. A high-speed, free flight facility will provide for investigation of the transonic heat generated by missile speeds from 7,000 to 14,000 mph. A steel pipe firing test chamber and instrument rooms will permit investigation of response, heating and stability at speeds from 2,000 to 6,000 mph.

• Lewis Laboratory, \$3,918,000. Con-

U.S.A.F Rating

By J. H. Turner, USAF pilot who commands one of the three RAF Hunter squadrons on an exchange assignment, into the British fighter jet force both the North American F-86 Sabre and the English MAG-15 fighters, but believe it is inferior to the F-100 Super Sabre now being put into operational service in USAFE. The Sappho and MAG-15 have been operational since 1956 and had two years combat against each other in Korea while Hunter development was lagging in Britain.

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version of the half ft. tunnel will permit transonic operation. Two test cells are planned for research on high-energy fuels for ramjets and turborays.

Please let NACA send these notes on to the House floor.

Rep. George D. Brown has shown his support with the majority of the people in NACA. They have had a long day as usual. How to build better airplanes than any other country in the world.

*I have no doubt that many of the scientists and other personnel of the NACA could benefit themselves greatly from a financial standpoint by leaving the NACA and going with aircraft manufacturers and private research groups."

**Lockheed Prop Device
Cuts Cabin Noise 25%**

Burbank, Calif.—Lockheed Aircraft Corp. has announced a new propeller synchronization system designed to reduce noise level 25% greater.

The combination electrical and hydraulic system was developed by Lockheed flight test engineers to reduce noise in the passenger cabin of transports.

►Millionth Accuracy.—The device, referred to as a "synchrophasing" system, keeps propeller blades in step with an accuracy of a thousandth of a second, according to G. L. Johnson, chief engineer of Lockheed's California Division. Flight tests have indicated that the device reduces cabin noise level about three-fourths the original but averages approximately 25%.

"Synchrophasing actually cuts sound two ways," Johnson said. "It reduces sound volume by 10 decibels and smoother and even the remaining sound to make it more acceptable to the ear."

Working with Lockheed on the system were the Hamilton Standard Propeller Division of United Aircraft Corp. and the Curtis Propeller Division of Goodyear-Wright Corp.

►\$10,000 per Plane.—No airline order has been received for installation of the system, Lockheed reported. But the device may become standard equipment after Lockheed transports.

No announcement of the cost for installation in present aircraft was made by the Burbank firm, but such a system probably could be installed for less than \$10,000 per aircraft.

Weight of the total system is estimated at 65 lb.

►Special Relationship.—Synchrophasing, Johnson explained, is a means of controlling the propellers to turn at a specified relation to each other and at precisely the same relative angle to the fuselage. Vibrations from propellers by air blast are reduced 75%



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AERONAUTICAL ENGINEERING

Scientist Shortage Threatens Defense

By Henry Lefc

The gap between America's need and America's supply of trained technical/scientific manpower is large, and growing larger. There is hope that it will be closed in the next few years. But in the meantime, says a leading research group, "We are sitting on a time bomb."

Donald A. Quarles, Assistant Secretary of Defense (R&D) warns: "The critical shortage of engineers and scientists in America is potentially a grave threat to national security than are any weapons known to be in the arsenals of aggressive nations."

It is an axiom of defense planning that the United States and its allies cannot hope to match the Moscow-Polozov axis in war raws. Russia and China between them, not counting the other satellite nations, have a population of more than 750 million. The cold war, in the words of Quarles, "is a technological race with the Communist world."

► **Looking the Race!**—How are we doing in this race? Not too well.

At present, in fact, the U.S. has about 580,000 engineers and 260,000 technicians. Russia has 960,000 and 158,000. But we are graduating fewer than 22,000 engineers a year, a figure that is expected to rise to about 27,000 by 1976, a peak of 34,000 in 1977, and then decline.

Contact this with Russia. From a 1952 engineering graduate roll of about 30,000, the rate has risen steadily and is expected to reach 45,000 in 1976.

Add in this picture the figures for technicians—the men who maintain the complex equipment on which our security is based and who must move highly trained engineers and scientists in their jobs.

In Australia, 1,700 technicians (including training schools) whose payroll enrollment is about 16 million the debt, nucleus of official Bureau documents informs. In the U.S. there are about 1,600 two-year technical schools with a total enrollment of 78,700. These figures do not include technical institutions maintained by USAF, which are extensive. But there is no reason to believe that Red Air Force efforts in this direction are less extensive.

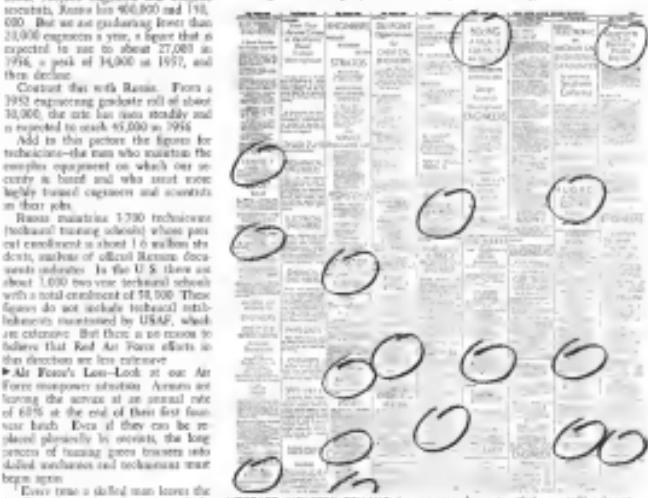
► **All Fools' Last-Look!**—In our Air Force manpower situation, Attrition set leaves the service at an annual rate of 60% at the end of their first four-year tour. Every 10 months, we lose people physically by attrition, the long process of normal career losses from delayed inductions and technical tour begin again.

Every time a skilled man leaves the Air Force, it costs us money—a little

flight after 110,000 engineering man-hours. It took the same Congress 1,140,000 engineering man-hours to bring a new jet to flight. Another engineer requires an equivalent of 8 man-years engineering man-hours for development of a new bomber.

This figure only to specific aircraft projects, but typifies the increasing technological basis of our power. While our population is doubling every 15 years, and the skilled workers is doubling every 20 years and the engineers and highly-trained scientists even 18. Right now, engineers and scientists make up only 0.5% of our total population.

► **Why Study?**—But scientific vacuum apparently does not have a strong enough appeal for our young people. One reason is economics. It takes an average of 27 years for an engineer to double up financially. And his brother who went directly from high school to a job at, let's say an electronic induction, says John F. Victory, executive secretary of



the National Advisory Committee for Aeronautics.

This file also records the pay the technician was receiving while the engineering student was paying for his schooling.

Jobs for the high school graduate are plentiful and the payng of the same-time course seems reasonable if you made the effort to put off your job to go to college and get the money saved until after the job gets a thorough professional education. Of those high school graduates who have the makings of engineers or scientists, only half go to college and only about 40% finish college.

That can of even 10 potential major science students do not get a college degree. Only 2% of my college graduates go on to become PhDs. And in this country of the 50,000 holders of advanced degrees, perhaps one fourth are specialists in science and engineering, the remainder hold degrees in the liberal arts.

► **Rejected the Defeat**—Accepting the situation is the comparatively small step of young people of college age, itself of the few birth rate of the Depression Thirties. We have already felt the weight of this, and should be the spring now.

A future which has the engineering profession specifically set the profession by a government agency isath better than we were having into a period of engineer surplus. But, Korea and the warming up of the cold war has increased the expected surplus and is increasing the storage. The current of this is a strong one.

Four thousand more men will need \$1 billion at \$30,000 new engineers a year through 1956. For the period of 1951-59, the job up to 130,000. We expect to produce 80,000 during this period, a deficit of 14,500. But of the 15,000 graduates, 10,000 are members of the ROTC and have a military service obligation after graduation. Some of these will later be available as engineers or scientists in industry or government, but this will be after 1956. In the meantime, our total calculated shortage of engineers by the end of 1956 will be 73,000.

► **Radi-Poly-Silicon**—The problem in Russia is entirely different.

Science training is encouraged. Students are paid during their schooling. The prestige and pay connected with scientific careers is such that in many if not all disciplines are reported to come above average. This makes it possible to choose the "creams of the cream" for technical and scientific training.

The Russians are and by our methods to be especially outstanding in mathematics, nuclear physics, solid state physics, low temperature physics, psychology and some aspects of elec-

tronics. An indication of their electronic program can gases when the Russian border closed up at the British Commonwealth countries bordering with us as amount of search and the control side advances is every aspect comparable to one of our own countries in the same stage.

Russia scientists get generous living allowances, good housing and other material advantages. Their advancements are rapidly reported in the press and their personal awards are frequent. All of this adds to the prestige of Russian technology.

► **Seven Institutes**—The Radi Institute since "aviation institute" that give a 7-year degree whose rough equivalent would be an American 18-month-plus-half-degree. Current graduating classes of these institutes should number between 1,750 and 2,000. The comparative figure for the U.S. is probably 750 to 1,000 from 1949 to 1951.

These seven institutes train engineers in aircraft structures, engines and propulsion devices, servos and flight control systems, aircraft materials and aircraft training. In addition training is provided in specialties such as aerodynamics, hydrodynamics, heat transfer, glass and silica insulation devices, ballistics, strength control devices and automation techniques.



Vought Lowspeed Tunnel

Carefully recorded data on the 200 mph range, particularly on landing and takeoff behavior of new aircraft and missiles, will be gathered in Glendale Vought's new 500,000 square-foot wind tunnel recently opened. Tunnel height measures 70 ft & although the speed will be comparatively low, data obtained may be projected up to 100 mph. The fan is a 20-ft. DIA spur gear test, hand driven. Glendale Vought personnel and others in a 1,000-ppi climate meter. Wind speeds up to 200 mph have been developed. For research purposes, a cooling system sprays 800 gal of water per minute over the entire driving test section.

Students are exempt from the draft, since at time of war. Upon graduation, they enter on a short period of basic military service, then are commissioned and placed in the active service.

Russia scientists get generous living

allowances, good housing and other

material advantages. Their advancements are rapidly reported in the press and their personal awards are frequent. All of this adds to the prestige of Russian technology.

► **Adjusted Degrees**—There are other institutes schools of professional level in the USSR. They include an industrial academy for aircraft industry management and management personnel, a supply and sales college, a metallurgical college, four major military institutes engineering schools and two civil civil and naval engineering schools. The Red air force operates a number of engineering schools also, which are not of profit school level.

Six of the seven aviation institutes provide graduate training, as do the military aviation engineering academies, the research institute of the Academy of Sciences and five major aircraft institutes operated by the Ministry of Aviation.

Total number of research universities in the USSR in 1947 was 65,000 of which 44,000 were engaged in basic research. Obviously, this figure is now larger.

► **Manned-Fight Attack**—What are we doing in the face of all this? What can we do? The attack on the problem is under way in my home town.

The National Science Foundation conducts studies and awards grants and fellowships for basic research in the natural sciences. It sponsors meetings and conferences of scientists and teachers. It maintains a register of scientific manpower. NSF is charged by the government with the job of promoting and encouraging research in this country.

► **NSF Grants**—For the year ended June 30, 1954, NSF made grants of \$13.4 million to 776 institutions for various projects. Of this amount, more than half went for work in the mathematical, physical and the radioactive sciences. The maximum sponsored 736 fellowship, of which 657 were for postdoctoral work, 79 post-doctoral.

Through the foundation, the U.S. along with the USSR and about 40 other nations, is sponsoring the International Geophysical Year, 1957-1958.

One share of the IGY program will include studies of solar radiation (which affects weather, radio communications, radio navigation systems), meteorology (including atmospheric balloon programs at the North and South Poles), upper atmosphere (radiolar, ionospheric physics, geodesy), cosmic rays. A total U.S. outlay of \$15 million is planned. Preliminary work has already started.

National Science Foundation runs a Research Information Service. At present it translates about 1,000 papers per year of important non-American papers.

► **Industry's Role**—Industry is trying to maintain an average class of the leaders of manufacturing and increasing our technological lead. A survey of eight aircraft manufacturers shows that these companies sponsor a total of nearly 1,100 scholarships a year in engineering and allied fields.

Our company provides financial assistance to 700 employees who are majoring in engineering programs. Another company provides dozen of scholars for those working in study engineering full time. This pattern of scholarships and financial aid to employee students is widespread throughout the industry.

Our association and high school principals to recommend outstanding graduate students to attend to courses in engineering schools. These are held with a 20-hour week, giving them time to attend school. If they complete their studies, the company schools them.

There are other programs. General Motors research announced use of helicopter—a \$2 million program plus under which 350 four year scholarships will be made available, plus annual grants of \$100,000 each to be granted among 300 colleges. Added to previously announced GM program, this will cost the company \$4.5 million a year after first year. Wellington firms awarded ten-year scholarships for science, engineering and many other such places.

Is a name program such as those reported nothing but enlightened self interest? A McGraw-Hill Publishing Co study points out: "If business firms do not voluntarily go to the financial aid of higher education, there is every prospect they will soon be providing most financial support for higher education through taxation."

► **Teachers Needed**—One of the deepest areas in our technological future is the acute shortage of qualified science and math teachers in high schools.

More than 100,000 high school students in mathematics and science are adequately trained teachers," says the Engineering News-Record Corporation of New York. The number of those graduating from colleges and equipped to teach science dropped from 8,600 in



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1951 to 9,060 in 1954. Compare this with the need for new science teachers of 7,720 in 1954.

Another danger to our technological leadership is the growing stress on general studies in high school, with consequent neglect of mathematics and the sciences.

So my attack on the engineer-education shortage must be made at the high school level. Prestige and pay of teachers must be increased. Teachers must be given an opportunity to keep up with their specialties. Some corporation are making a contribution here by giving summer employment for high school teachers.

It is suggested that industry and professional groups co-operate in arranging plant visits for school groups and in other ways keep them interested and informed.

► **Exposure to Draft-A**, concern can prevent of research and schools is the lack of a clear-cut policy on the drafting of students among all knowledgesitic careers. Exemption from military service for any group is a politically touchy subject.

Most industry service plans contravene that every young man in the appropriate age bracket will have a taste of the service life. In service he does not work out, and most military manpower requirements are not large enough to include all in the eligible pool.

So annual drafting often is at the "when of the least draft board," many scientists complain.

► **The Classics**: Young, a very high percentage of important basic discoveries are made by men in their early twenties, scientists point out. Even if a man returns to science after his military service, they say, we have lost some of his most creative years.

► **Personnel Selection**: A proposal is made clear by Dr. H. A. Mershon, president-elect of the Scientific Manpower Committee. Every man should put in some time in government service for the country's military protection, he believes. But this does not necessarily mean military service. Consideration should be made of the person's special ability and he should be assigned to the service which makes the most use of his talents and training.

► **Red Tape**: Tingle—Regulation of the outcome of my proposals for the increase of our supply of technical people, we will have to live with the facts of the drafting for some years. It is vital, therefore, that we make the best and most efficient use of the limited supply available.

One way of doing this is to eliminate the red tape traps that restrict the options of so many scientists, especially in government. The National Advisory Committee for Astronautics, which en-

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plies about 7,000 of whom about one-third are research and research scientists and design and facilities engineers, has made outstanding strides in this direction. The burden of mid-type and administrative details has been nearly completely removed from their shoulders, forcing them to do what they were hired to do—research, says Robert J. Larklin, NACA personnel officer.

This not only helps make better use of scientists, it helps to keep them. One of the major objectives of these same people is to present science at the highest level of paper work involved. "From education on up," says administration, "is a concern plus."

NACA Survey—A study conducted among persons of NACA's Ames and Langley labs by the Interdepartmental Committee on Scientific Research and Development uncovered a number of approaches for making government surveys attractive:

Among the favorable factors were freedom from pressure to develop findings for commercial purposes, opportunity for fundamental research in large, well-equipped labs, opportunity for publication of findings, contact with top scientists in and out of government.

Conditions were appraised under two headings of personal conditions and general institutional conditions, illustrating support on the part of those conducting the survey, strength, loss of prestige or permanent damage as a result of statistical investigation, and the widespread understanding of opposition and suspicion throughout the nation directed against "bigotous" and unscientific.

Fay and Admire—There were plans for the Fay (in conjunction with its Army), maximum of attainment benefits, opportunities for adequate professional recognition and growth, a policy of advancement for scientists working in science. On the other, the task was a constant one, according to Fay, to keep on talking about advancements in science.

NACA has tried and expects to get permission to issue the job of its lower grades, to get them within striking distance of the job offered by industry for comparable work. A good deal of the money consists of better public relations—getting the story across to the press and to the public in general.

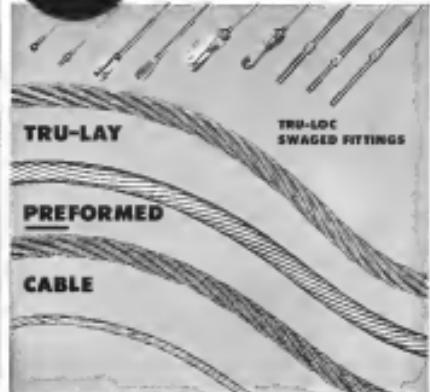
Santile—Santile—Scientist-in-charge of the Survey—his prestige would increase if they could wipe out the widespread feeling that our national research establishments are methods of reduction.

They are not a mere source and storehouse of knowledge in the scientific problems. "The fate and security of the United States depends on progress," says Prof John R. Dunning, dean of engineering at Columbia University.

Specifically, scientists ask for freedom

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from military and civilian organizations. They point to the case of the Republic Aviation Corp. engineer who was dismissed last year as a "security risk" because he had a "psychopathic background" that made him too unstable for secret work. On appeal, it was discovered that since even status consider had misread or misinterpreted a notation on his record that he had been discharged from the Navy with 100% disability for "service caused by intense driving of aerodynamics." (Simple ret., a request was denied.)

The story has a happy ending. The Federal Industrial Personnel Security Board's appeals committee recommended last

► PROBLEMS — This is a common mistake made in the security situation after Sen. Joseph McCarthy had charged that use of civilian research staffs was hindering a large number of disloyal employees. Applications for jobs went up sharply. Some observers feel that in with the growing angle—everybody wanted to be able to say he worked for the government or very important, had high rank.

It might be a worthwhile undertaking for educational foundations to sponsor a whole series of new awards and bonuses in recognition of scientific achievement.

All of these things provide clues as to approaches which could increase the value of the scientific manpower.

► Engineers in Industry—Obviously, in any fair competition for technical manpower, industry will get the lion's share. This is because of higher pay scales, greater opportunity for advancement, the desire to see one's ideas translated into practical reality fairly early.

There are 71,000 engineers employed in the aircraft industry—out of nearly 11 million. That number will rise. The competition between employers for engineers and assistants is intense, although scaling is already known upon. So is the competition between industry and government. The struggle will continue, however, as the supply is short. Only if the various programs underway and contemplated succeed will the labor situation be relieved.

Meanwhile, industry must do its best. Many complaints are heard from engineers that they are not being used to the limit of their skills. They are tied up on low-grade tasks and administrative detail, which could be handled by others without thin specialized training and skills.

We should follow the British in extensive employment of women.

Air Force

The Air Force is faced with an especially severe manpower situation. This is not so much one of pilots and



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The chapter is among the group whose first anniversary marks now and in the next few years.

This group includes the headquarters of Air Transport, Inc., located in USAF, in the command building at Keesler Field, while the Air Force has gone from 44 wings to 75, to 95, 110 and 145, and expect off to the present figure of 137 wings, to be reached in 1957.

► End of the Hitch?—These men have fulfilled their obligation under the law; they have completed their contract with the Air Force. . . . There is no compelling reason for them to remain in the service," says Brig. Gen. R. H. Canfield, Air Vice Director for Personnel Processing and Training (Air Personnel and Resources).

Surveys made by the Air Force show that about 80% of these men plan to resign, about 10-15% apply for retirement, and the remainder are undecided. Of those with more than five years of service, close to 75% say they plan to resign.

Air Force estimates that in the fiscal year 1955-1957, close to three-quarters of a million airmen will be released from the service for various reasons. According to present intentions, about 150,000 will resign and 180,000 are considered nonrecoverable (retired, dead, unfit or deceased, failure to graduate). This leaves more than 400,000 airmen whom Air Force would like to hold on to.

The last in dollars represented by this 400,000 man group has been put at \$1,000,000,000. We except the estimate that it costs an average of about \$15,000 to train an airman to the level of skill represented by four years' service and attendance at *various* USAF schools.

► Half-Timed—More important is the consideration that this group together with the nonrecoverables add up to more than half of the planned USAF level of 975,000. Preserving this situation through all major commands, one can envisage a Strategic Air Command, for instance, with this kind of whose personnel is considered fully trained. And, Air Force says, in this age of speed it is quality, rather than quantity which counts.

Air Force takes the training and imposes his to certain priorities, whereupon he can be utilized to help to skilled levels. At the end of his first four-year obligation, he is considered skilled or even super-skilled.

The destiny of that resource is a mystery. Perhaps pleasure would be simplest. Most, as applied to the service's priorities should do the trick. Lt. Gen. Ernest O'Donnell, Jr., Deputy Chief of Staff (Personnel), points out, however, that steps appear to be toward, and Air Force has set its eye

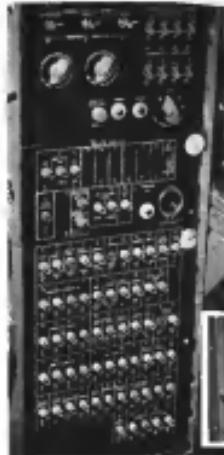


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NEWS OF G-E AIRCRAFT PRODUCTS



Douglas B-66 takes off for test run. Defense includes G-E constant system shown in photo above.

B-66 is first tactical bomber with radar controlled defensive armament system

The U.S. Air Force's latest fast jet bomber, the Douglas B-66 will be the first combat bomber defended by General Electric's MD 1 fast control system. Until now in just last year, the B-66 is capable of carrying atomic bombs.

Like other G-E designed and produced defensive armament systems currently in operation, the new B-66 system is composed of control equipment, and a tail turret mounting two guns.

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A similar system was installed on the B-57, operates as follows in performing these functions as a "package" tail defense:

- Automatically tracks and positions the gun on selected target by means of radar.

Automatically supplies warheads, balloons and lead curtains by means of an electronic computing network.

- Guns fire electrically under control of the computer.

HOW SYSTEM OPERATES

Briefly, here's how the system operates: When the B-66 notes a danger zone, the gunner rotates the radar to "sense" and adjusts the system control panel to provide the computer with air temperature, altitude and air speed information.

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Solar does supplies the computer with the position and range of the attacking plane. Necessary gun deflection and corrections are computed automatically. When the hostile aircraft enters gun range, the gunner presses a trigger which fires the guns electrically.

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Robert M. Pfeiffer, President, G-E Power Supply, Induction, and Transistor Division.

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Send coupon below, and check "C" for a new bulletin, describing the many features of the G-E hydraulic constant speed drive.

New right angle lead capacitors are specially designed for printed circuits

These surface-mount metal-clad lead capacitors with right angle leads are now available in General Electric's volumetric case line. The leads are welded to the ceramic housing and at right angles to the axial leads.

Especially suitable for printed circuit applications, the designation between leads can be determined accurately for each case size, with assurance that every metal-clad lead will be welded close enough to the axial leads.

Become the leads do not have to be bent during assembly, there is less chance of bridging and leakage. The welded "right angle" leads will withstand the same rigors as axial leads, vibration and pull requirements as the axial leads.

These right angle lead capacitors are available in a full range of ratings for 15°C and 125°C operation.

Check "B" on coupon to receive GEC 937A for further information on the new line.



New capacitors meet MIL-G-883A specifications

Progress & Our Most Important Product



**GENERAL
ELECTRIC**

Mail to:
Section D2H-93
General Electric Company
1 River Road
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- "A" Mass Flowmeter System, GEC-932
- "B" Surface-Mount Metal-clad Capacitors, GEC-937A
- "C" Hydraulic Constant Speed Drive, GEA-597

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FASTESt
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ONLY NONSTOP
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Lv. Washington (EST) 12:58 AM 10:00 Noon
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Lv. Los Angeles (PST) 8:45 AM 9:45 PM
Ar. Washington (EST) 7:25 PM 7:25 AM

There's new convenience in America's schedule between the nation's capital and Los Angeles. You now have a choice of two nonstop flights, daytime and nighttime, as well as two single-stop flights. And between Washington and San Francisco there's now nonstop service. All flights are by DC-7, America's fastest passenger plane. Enjoy first class luxury service at regular fares.

AMERICAN AIRLINES INC.

American Leading Airlines



but a number of long-range, positive programs aimed at "teaching the people who work can remain and returning the people who leave." One

► Quarterly Surveys—One phase of the attack on the recruitment problem is a series of quarterly surveys on various' recruitment initiatives. These normally track 5% of the total service population in each geographic zone. From these, planners have been able to do increase the factors that appear to make Air Force life attractive or unattractive, and they thus open up fields for exploitation to make the recruitment percentage go up.

An interesting point the surveys have brought to light is that those with more education are less likely to enlist, and those who are less likely to move to predators, who are from a rural background and come from the southern and mountain sections of the country are more likely to enlist.

However, "it is doubtful if the mere power pool will ever be large enough so that technical training can be offered. For example, only to anyone without college, who've received and fixes rural backgrounds" is an Air Force study which reports.

► A Step Up—One fertile point the surveys have measured: The sources who tend to recruit are those for whom the Air Force represents a step up both socially and monetarily. The recruiting of the USAF planners is that the Air Force ought to be made a step for a greater percentage of the population.

The world would mean gay, better housing, greater prestige among citizens to recruit a few more persons.

A good deal of Air Force manpower problems is shortly and in its own words. It calls for public and congressional recognition of the situation and the need. There is a great need to establish the Air Force—and the other military services—in a way of life (peace) only in an individual's life. This would appear to be a long-term educational project involving some every house and school.

However, there are many members of the USAF staff in working which could be done early (just).

► Re-Us—Reenlistment Branch has been set up. This is the reenlistment. An Staff organization is deal with the problem. Under its wing there has been set up a Package Program for Reenlistment, which deals with the various factors that operate on the morale of the service, and are considered largely instrumental in whether he stays in the service or goes.

The package suggests reenlistment procedures and presents plans that will be in effect at various command and bases. Field Management teams have been set up, which will have visited all 149 Zone of the Service bases by the end

*Cost
Saving
Ideas...*



15,860 different types and sizes of GEAR SUPPORT CUPS, LINE SUPPORT BLOCKS and HARNESS STRAPS for pedestal, vibration-free support in aircraft, mobile and industrial installations.

Consider the advantages of standardization—simplicity of form—a smaller and more flexible inventory—quick and easy training of personnel—safety—dependability—longevity—ECONOMY.

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NOZZLES

Delavan . . . designer and manufacturer of fuel nozzles for Pratt & Whitney Aircraft's JT8D turbojet, powering the Boeing 747 Stratoliner. Delavan has brought unprecedented nozzle performance to the aircraft industry.

DELVAN Mfg. Co.
GRAND AVE. AND FOURTH ST.
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The radar tower that builds itself!



You will see so many of these radar locations so far from civilization, that the question comes easily to mind: how do they ever dare to choose inscrutable places?

Radar is complex. The equipment is not always easy to handle. Large construction crews and great times are almost always needed.

"...lift their own bootstrap."

A way had to be found, "to lift these radar towers up by their own bootstrap"! In the far away, difficult places. No large crews. No great lifting gear.

Bendix® Radio engineers came up with the way to do it. These towers, so big and so intricate and complicated as they are, were ingeniously designed into almost "do it yourself" kits.

Each part is marked and numbered. Circuits are grouped and coded. Holes are drilled exactly. Seats fit precisely.

Working from the Bendix easier plan, using the great leverage of the simple Gantry crane, small crews now put these towers up and into operation.

even with a minimum amount of apparatus even under extreme conditions of audience, heat and cold.

This is just another indication of the extra "thinking through" that Bendix gives to any engineering problem . . . from the drawing board, through design and development, on up to the final (and often unusual) installation requirements.

Other radar

In other fields of radar, Bendix also makes both X-band and C-band airborne radar; the SPN-8, first successful aircraft carrier controlled approach radar (with gyro stabilized antenna); and the MPN-5, mobile radar test with Moving Target Indicator scope, that closes up all ground clutter.

Can Bendix help you?

All this Bendix experience . . . from the ablest scientists, engineers and workers . . . is available to you and your problems, simply for the asking. Write to the address below.

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Thousands of Honeywell gyroscopes are produced here each month in the largest automated production plant in the world. Every unit is checked and tested...guaranteed for trouble-free service...with computer test-purser and humidity control!

The new Honeywell HIG-4 Gyro — mass produced with precision accuracy

AN OUTSTANDING ADDITION to the Honeywell "Gyro Family" is the new HIG-4. The most accurate of the miniature gyros, it's ideal for such applications as aircraft and missile stabilizers and fire control systems.

The HIG-4 is readily available for your needs. With test and production facilities unequalled in the industry, Honeywell is poised to produce thousands of miniature gyros a month. They're shipped in the gyro field!

The specifications are on the reverse side fully detailed below. For further information, and for information on the full Honeywell gyro line, write Honeywell Aero Division, Dept. AW-350, Minneapolis 13, Minnesota.

Specifications of the new Honeywell HIG-4



Size: Diameter: Bore: less than 14 degrees per min.

Speed: Maximum Velocity: Revolution: Less than 6,000 to 12,000 rpm; less than 6-28 in. 2 inches/sec.

Stable Errors: 2.7°

Gyro Torque: Velocity Output: Angle Input: 21 millivolts/volt.

Characteristic Time Constant: 2.1 milliseconds.

Output Power: 250 watts (warm-up), 20 watts.

Warm-up Time: 3 minutes from -65° ambient to 70° weight.

Weight: 1.5 lb.

HONEYWELL
Aeronautical Division

112 OFFICES ACROSS THE NATION



presenting one of the bright spots in the aircraft market.

► **Level of 750,000.**—The aircraft industry—the nation's largest employer—had 75,000 on its payroll at the end of the year, down from a 1954 peak of 130,000. Employment is expected to level at about 750,000.

The drop, on the average, is set the result of design, but is due to natural attrition—death, retirement, change of job in another industry. It is a result of increased productivity as new methods and techniques are introduced, and of a higher position on the learning curve in the development of the early part. Known product goes up to a long term period of procurement stability, with buying hovering around the 10 billion mark.

(Continued on page 10)

► **Bush Air Problem.**—For that reason, the drift has not hurt industrial production. As a matter of fact, all industry went for only 17,000 occupational fatalities last year, and 21,000 in 1953 (approximately 98,000 decrements in 1954). According to the assault industry's definition, the available workforce there can be selected, and, except those in "total disability service," all they are in "total selective service." They point to Secretary of State John Foster Dulles' statement that interplay is not the true measure of military strength. Technological advances have made the manpower cuts (proposed in the Administration's new program) possible. Dulles has said,

Allison Gets New Jet, Turboprop Contracts

Jet engine contracts totalling \$1,582,415 have been awarded Allison Division, General Motors Corp., by the Air Materiel Command, Department of Defense contract #1515. The contracts call for 176 engines. The contract award to Allison for \$120,000 for a turboprop engine also was total.

An order for 149 reciprocating engines was announced for Contractors Marmon. This contract is valued at \$476,140, including special tools and ground handling equipment.

Other major contracts included:

- Kellogg Instrument Corp., Elkhart, Ind., \$1,000,000; \$1,013,812.
- Curtiss-Wright Corp., Cicero, N.Y., eight units, \$180,000.

AIRPORT WEEK, March 21, 1955



Again in 1954 Pan American's First

on the Skyways of the World!

Throughout the world, there are now 60 aircraft flying in conjunction with Pan American World Airways. Many of these are government-owned monoplanes. Yet Pan American, operating under the American private enterprise system, was chosen by more tourists than any other airline, 5,975,000 scheduled, around the world flight during 1954.

Across the Atlantic, there are 21 nonstop flights between the Americas and Europe. The Rainbow is the fastest of any other airline ... U.S. or foreign. In fact, The Rainbow shows a 50% increase over 1953.



to all Europe.
First in popularity
among all
trans-Atlantic air
tourist services!

The votes are in and the votes have been counted.

In 1954 more people chose Pan American's tourist service, The Rainbow, than that of any other airline ... U.S. or foreign. In fact, The Rainbow shows a 50% increase over 1953.

The Rainbow gives 6 routes choices:

1. Nonstop trans-Atlantic "Superfast" Clipper.
2. Nonstop trans-Atlantic in the same speed into Europe which prepares the much-needed link for the American Free Clipper service.
3. Nonstop trans-Atlantic to London and Paris.
4. Direct service from New York, Boston, Philadelphia, Newark, Chicago to many cities in Europe than any other airline ... no change of plane.

5. Nonstop trans-Atlantic to London and Paris.
6. Direct service from New York, Boston, Philadelphia, Newark, Chicago to many cities in Europe than any other airline ... no change of plane.

7. Nonstop trans-Atlantic to London and Paris.
8. Nonstop trans-Atlantic to London and Paris.

9. Nonstop trans-Atlantic to London and Paris.
10. Nonstop trans-Atlantic to London and Paris.

Between Hawaii and the Mac-

land, Pan American carries 1,700 pas-

senger passengers—both first class

and coach—and that is why other

airlines are envious.

To and from Latin America, Pan American carries more passengers than any other airline ... no change of plane.

11. Nonstop trans-Atlantic to London and Paris.

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the new CORE MAGNET MECHANISM
by ROLLER-SMITH
master instrument makers

... outperforms conventional mechanisms of much greater weight in a wide variety of applications... yet it's rugged and "tough" in dependability.

Combining improved efficiency and performance with miniaturization, Roller-Smith's new Core Magnet Mechanism is an outstanding achievement... a precision, self-holding movement that can be counted upon to increase the prestige of your product through consistently excellent operation.

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Core Magnet Mechanism is only half
the Roller-Smith story!*

Just as important to you is our ability to furnish the designing aid necessary to incorporate it into your own equipment. The Roller-Smith engineering staff, headed by world-renowned experts and backed by the finest in research and development facilities, will be glad to assist you in arriving at the most practical solution.

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See this and other outstanding Roller-Smith products featuring the "Year-Ink" at Booth 702 in P.E. Show, Kingbridge Avenue, New York City, March 21-26, 1955.

IAS Summaries

More than 500 presentations on the many fields of research located in the several divisions of the Institute of the Aeronautical Sciences have been made. From this large group, AVIATION WEEK selected representative summaries for publication.

This is the final installment of the series that began on the issue of Feb. 24. Requests for reprints of the papers should be directed to the Institute of the Aeronautical Sciences, 2 East 65th Street, New York City.

Air Transport

► Direct the Rotating-Beam Colorimeter and Transmissometer in the Reporting of Color and Visibility—R. C. Wadsworth at Cheyenne, Weather Bureau, Fort Collins, Colo.

The development and characteristics of the rotating-beam colorimeter and the transmissometer are described by Wadsworth, with comments from the new instruments at the Weather Bureau at Silver Hill Mill and at Washington National Airport are summarized.

► A Flight Investigation of the Performance of Low-Color Visibility Monitoring Equipment—R. F. Snodgrass, Chief Engg., Test Pilot, Spruce Goose Co.

The Air Navigation Development Board in cooperation with the United States Weather Bureau has conducted a flight test program to evaluate operational use of the three instruments in terms of minimum visibility ceiling. Results with sub-report to what extent the visibility during actual weather ILS approaches.

► A Review of High-Altitude Color Transmissometer Design Criteria in Relation to Future Transport Operations—R. M. Hatchcock, Staff Eng.—Struct., Boeing Airplane Co.

The problems associated with high altitude light for transport aircraft using direct and projected illumination systems are presented. Methods of increasing reliability and safety of projected color for early warning, landing or other damage avoidance are outlined.

► Design Considerations for Twin-Engine-Powered Cargo Aircraft—Winfred H. Dunn Jr., Project Design Gr. Engg., Lockheed Aircraft Corp.

The purpose of the paper is to discuss some of the design considerations and resultant aspects of operation concerned in heavy cargo aircraft.

The presentation is divided into four primary sections: First, cargo loading and cargo handling problems related to aircraft design are analyzed. Particular attention is given to weight-craft cargo loads will affect ground loadings.

The second part of this paper investigates the effect of reengaging cruise on the operating costs of cargo airplanes in comparison to the direct operating costs of three different airplanes over the Los Angeles-Chicago route are presented. Below factors are the

ATC cost formulas are related to the total direct operating costs for each model.

Flight Safety

► Cooperation With The French and Other Non-Digitized Aviation Safety Committees at Cornell University

► Escape from High-speed Aircraft—Eduard H. Frost, Vice-President, Stanley Aviation Corp.

A brief review is presented of the problem of emergency escape devices for high-speed aircraft. The original German English device is described. In addition, the basic U.S. Navy ejection seat is described and the fundamental research done by the U.S. Air Force is outlined.

► Design Safety Agents of the Boeing Tilt Wing—L. W. Morris, Aeromech. and Safety Engg., Boeing Airplane Co.

These design safety philosophy of the Boeing Tilt jet transport is described. Methods of analyzing and obtaining operating experience from military and civil aircraft are presented. Results of the Boeing Tilt jet research are presented. The methods used to establish the probability of hazardous events and their consequences are discussed. Present day trends to minimize the consequences of remaining possible failures.

Flight Propulsion

► Safety Afterburner—Frank F. Kunkel Jr., Safety Design and Evaluation, Small Engine Dept., General Electric Co.

The objective of the paper is to compare the performance of a basic 1,000-lb thrust afterburner in shockwave generation at the nozzle to one having a shockwave in an annulus.

Criteria for minimum safe nozzle exit velocity are presented with results of nozzle exit velocities at altitudes of 20,000, 40,000, 60,000, and 80,000 ft over a range of flight Mach numbers 5.0 to 2.0. Single

point data for primary exit of 4 that it was used to select the design point.

At altitudes from 20,000 to 80,000 ft the lean nozzles exit losses to the characteristic spectrum of the turbine was dependent on specific fuel consumption and the need to limit the engine's tendency to self-choke due to an afterburner.

Helicopter Dynamics

(In Cooperation with the American Helicopter Society)

► Notes on the Effect of External Operating Conditions on Helicopter Flight—Robert J. Expert and E. A. Cuthbert, Aero Research Standards, Langley Air Force Base, NACA

An approach with non-conventional type blade-loading characterizes the high-performance, higher-speed helicopter. A study of the effect of external operating conditions on the performance of the Bell 47 is presented. The results of this study are discussed. Present day trends to minimize the consequences of remaining possible failures.

Jet for Aircraft

(In Cooperation with the American Rocket Society)

► Zero-Length Launch for Manned—G. J. Edney, The Glavin L. Motor Co.

Exhibition of zero-length launch techniques for the Air Force T-38A fighter, which reached the world's greatest altitude record in a single stage rocket motor, is described in this paper. It also discusses the design problems encountered and solved and in addition gives some historical data on the testing procedure.

Supplementing the paper is a short summary picture showing some of the early research work done in the development of the T-38A. Included, together with a short account of the various launching methods involving single and tandem dive planes.



Connie Family Brings in More Than \$1 Billion

More than \$1 billion in orders have been generated by Lockheed Aircraft Corp. as a result of steady development of its original Constellation transport (No. 3, left) which first flew in 1941. This cluster of transports at Burbank, Calif., typifies one of the leading stages Connie reaches. No. 1 (right) is President Eisenhower's personal transport. Constellations 3, No. 2 is a

Navy MATS ECW/II, No. 4 is an ex-“ Flying Laboratory”, No. 5, Starboard 2, Western Airlines, No. 6, USAF RC-131D radar early warning plane, No. 7, Navy WVZ radar early warning plane, and No. 8, RIV-2 (turbojet-powered prototype). First Connie weighed 72,000 lb, latest Super Connie weighs 110,000 lb.

PRODUCTION

Stretch Forming Control Improved

- New technique assures constant elongation.
- Material and machine variables minimized.

By Irving Seiden

Toronto, Calif.—A technique that promises new accuracy of control for achieving part-to-part consistency in stretch-forming was demonstrated here recently by a first public showing to a group of about 200 representatives of surface bidders and allied interests in the aviation field.

Known as positive position forming, the process was perfected by Sheldon Gray, Inc., a research and development division of stretch-parts supplier T. W. & C. S. Shaefer Co.

► **What It Does**—The process is designed to provide a definite scientific relationship between the stretch force, the part and the die during the entire forming operation—control not available on existing stretch-forming machines, according to Leonard Gray, Sheldon Gray's vice president and general manager.

The part being formed is elongated by positive linear dimensional control only. "Result is a consistent and repeatable elongation according to a precise rate value." Effect of variables in the system is minimized, variability in the machine and operator are eliminated.

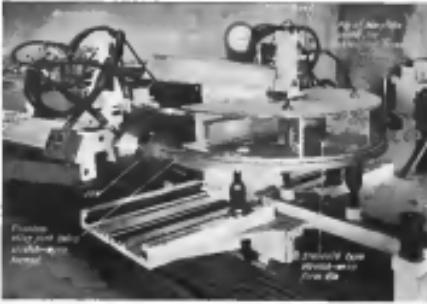
► **Shade Overview**—Gray sums up the new process this way:

"It is an improvement over the existing stretch-forming process as the latter was over head-forming." Gray sees no positive position forming process as the solution for the majority of problems experienced in present day stretch forming.

These include non-repeatable spring-back, operators error, lack of consistency of large-diameter machine when forming small cross-sectional parts, relative sliding of wide on the die, inadequate control of elongation due to variations in dimensional and physical properties of the part, and variations in operating conditions (speed, pressure, packing factors) of the machine's piston cylinder.

► **Basic Input** is to incorporate the control in all Sheldon stretch-forming machines now operating as parts or to be built in the future.

► **Second objective** is to offer to the au-



SD4000-TAPE tool sets one per job of 20-ton Sheldon forming machine. Craft robbery a control package fit any size of stretch press save operating. In most cases, addition of the control would involve only a minor modification changing the trustee cylinder solenoid valve circuit to incorporate a hydraulic servo valve, addition of an operator's remote control lever, transmitter and picking unit, and servo amplifier.

Price of the installation on a 20-ton Sheldon extension stretch-press would run about \$37,795.

► **Advantages**—**Stem**—Positive position forming process is designed to:

- Eliminate extremely small cross-sectional parts, which damage stretch-forming machines.

- On certain machines, the maximum extension capacity (rate of tension cylinder pull) is about 15% of maximum, Gray claims, whereas with positive position forming the value can be dropped to 1% of maximum.

This means that a 20-ton stretch-press (common use for extrusions) can be used for a wide variety of work, eliminating the need to purchase small parts on a small press.

- Achieve consistent elongation. Because each part (as a piston rod) is elongated the same amount without being adversely affected by the variables in the material and machine, the resulting strength is consistent, parts to parts," Gray says.

► **Design**—To maintain its key variable, the tape length on it is wrapped around straight, smooth bars passed through servomotors in hydraulic servo-slides mounted with relative position of the bars to the die.

Because the servomotors supply signals from the operator he decides to supplement the template below, during or after forming cycle is completed.

►

Highlights

Outline of the template of the part being formed is a predetermined, measured needed wire bias between tension and compression at the part. Difference between pressure of film side and that of the outside of the finished part is equal to the desired percentage of elongation. Template is only one from physical.

Stretch units are equipped with steel tapes stretched as a tape located at center of template pretension. Tapes progressively take template contour during forming, handle parts faster, eliminate need for jigs.

Springback is eliminated as tape tension is tape length on it is wrapped around straight, smooth bars passed through servomotors in hydraulic servo-slides mounted with relative position of the bars to the die.

Because elongation is consistent, part handling due to excessive stretching is practically eliminated. The amount of hand-forming (after forming



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is considerably reduced.

Another key advantage, Gray says, is that the constant elongation allows the design engineer that the unrestrained clearance shown by test for parts from a first cut on the machine will be matched at the successive cuts.

• Reduce stock lengths, because relative sliding is eliminated between stock and die during the forming operation. (This is normal in having savings typical to a univex press fit application.)

• Reduce operator costs. Relationship between percentage of the die and template establishes the amount of elongation. Thus, a 10% air-parameter template would be used in conjunction with a die having a perimeter of 106 in., to give a 1% elongation. At the start of the stretch forming, the resultant length between the pins would be 100 in.

In this way, the tooling (template) controls the elongation—the operator has no control over it. On straight elongations, elongation is controlled by expander-adjustment of hydraulic pressure, Gray points out. Also at the completion of the warping cycle the position is measured for final set of the material. With positive position forming, the final stretch is set anyway.

• Ease with titanium alloy—Because of the small spread between yield and ultimate strength of titanium alloy, it is very difficult to control elongation by means of variable position—either when in the hydraulic circuit and the part itself becomes very sensitive.

By controlling elongation directly with positive position forming, the small spread between yield and ultimate is no factor, Gray says. Only consideration is the allowable elongation of the material.

For example, Sheridan-Guy uses a

series of titanium alloy (RG-134A) parts in conjunction with a major aircraft manufacturer. These parts were 425-in. Zeeckline sheet 14 in. wide with 1-in. legs and about 95 in. long—typical tail-leg fittings, or the shoulder area.

• Results—At the recommendation of the surface manufacturer, a 10-mm cycle was established for stretching forming to the tail-leg bend. The template was calculated to produce a 4.6% elongation in the outer flange of the part, since the surface manufacturer had specified 5% maximum elongation. Sheridan-Guy formed 19 pieces with very satisfactory results, it is reported.

The surface manufacturer was able to form the titanium alloy parts only under bimetallic conditions (with super-cooled oil), so methods development problems, it is said, had to be overcome. That is, the drop under normal production conditions which introduced factors of operator error, machine variations. Under the production conditions, part breaking was common.

• Big Machine Study—An engineering analysis is underway, aimed at putting the positive position forming control on the world's largest sheet press—a Sheridan 720-ton unit which will form 14-ft by 20-ft sheet. This press is now installed at the plant of a West Coast aircraft manufacturer.

Companies represented at the recent demonstration of the positive position control included Boeing (Seattle), Convair (San Diego), Northrop (Downey, Calif.), Lockheed (Lockheed, Calif.), Relia, North American (Los Angeles and Columbus), Chance-Vought, McDonnell Douglas (St. Louis), Marmon Hill, Republic (Belleville, Illinois), Mikro-Mig, Lear, Rhein Miles, Langren Aircraft, Doral Aircraft, Texas Industries, and many others.



P&W Ships Its 1,000th J57

Post & Wadsworth Aircraft Ground Manager William F. Green looks at the 1,000th J57 turbojet built by the firm as the powered wing is being prepared for ship-

ment from East Hartford, Conn. Delivery

of the J57 are producing more

than 11,000 lb. thrust without afterburner

(Aviation Week, Feb. 28, '62).

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OUT FOR THE NIGHT is the Boeing B-52 Stratofortress being moved off the company's Seattle production line.

Boeing Says B-52s Are 'On Schedule'



THREE ON THE LINE: Final assembly now at Boeing Seattle shows three of the noisy bombers awaiting completion and parts of at least six others. Tell mark of first plane never unusual shape.

* **Boeing B-52 Stratofortress production**, now concurrent at the Wichita, Kan., division and the Seattle plant, is the largest portion of the company's reported two-billion-dollar backlog.

Boeing reports both plants "are schedule," answering a recent statement by Sen. Richard B. Russell, chairman of the Senate Armed Services Committee that B-52 production was slipping.

First delivery to USAF of the eight-yeaer bomber will start later this spring, first unit to get the 650 mph plus booster will be SAC's 43rd Bomb Wing, Castle AFB, Marana, Calif. ► **In One Year**—First production B-52A rolled out last year, made its first flight on May 5. Production statistics have come out of the large down of the Seattle plant at irregular intervals since that.

Some troubling troubles, common to any new airplane, caused minor delays in flight test and elsewhere, says a company spokesman. But he emphasizes that the B-52 has been reasonably "log-free," considering size and type.

Current practice is to fly production airplanes from Boeing Field, Seattle, to the new \$10-million facility at Larson AFB, Moses Lake, Wash. Final installation of equipment and production flight test programs are conducted there. First B-52 was delivered on Feb. 25.

► **In Kansas**: The Wichita division has moved many employees from Seattle to final assembly where space is limited with production of B-47 Stratojet.

Some indication of the production capacity of Wichita was furnished last year when Boeing delivered the 1,000th Stratofortress to be built at that plant.

Among those pictures are the first two roles of Boeing's second-source production for the B-52.

Latest specifications released by Air Force say the B-52 never rolls the big bomber with a cargo of more than 5,000 lbs., and that both Boeing Flying Booms and refueling equipment is standard. A crew of six flies the 192,000-lb air plane.

Other specifications: Wingspan, 195 ft.; length, 156.5 ft.; height, 40.5 ft. Powerplants are eight FAIRCHILD T-33 turboprops rated at 30,000 lb. thrust. Armament: four 20-mm machine guns.

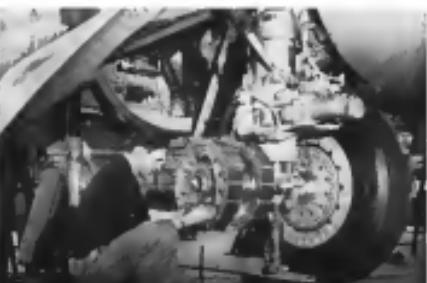
Boeing built an experimental XB-52, a service-test YB-52 and a limited group of B-52As. Current production models are split between B-52B and RB-52B. In addition, USAF sources put a contract for 50 B-52Ds.



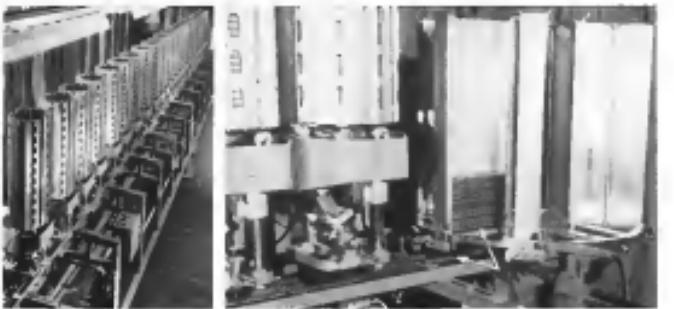
UPPER PANEL of B-52 wing is lowered out of extraction jig at Wichita.



CENTER SECTION of B-52 comes out of jig ready for final assembly at Wichita.



MAIN GEAR is built by Berlin, Cleveland Aircraft, Inc., wheels and brakes by Goodyear.



AUTOFAB, new device for mechanized assembly of electronics, consists of a battery of plow-type heads (4) each of which installs conventional components (left, four vertical segments) or printed circuit boards which are segmented to converge at end of line (1).

Autofab Sparks Automation Race

By Philip Klass

"Autofab," General Mills' new machine for mechanized assembly of electronic equipment, has pounced into a leading competitive position within weeks after its public unveiling (Avionics Week Feb. 21, p. 7).

Seven TV-radio manufacturers have placed firm Autofab orders. Other companies, including firms in the avionics field, are negotiating for the machine. A General Mills spokesman says company names can not be divulged yet.

The first Autofab capable of handling printed circuit boards with 26 conventional components installed automatically in a mix of 12 boards per minute has been delivered to International Business Machines Corp., where it will be used to build logic digital computers for its defense. A comparable unit would cost approximately \$90,000, with delivery quoted at six to eight months.

With a system under its belt, General Mills is anxious to have the jump on United Shoe Machinery Co. and Autelco Corp., which earlier developed mechanized assembly machines for placing conventional components in printed circuit boards.

Extent of industry interest in Autofab is evidenced by the report that all major TV-radio and computer makers

have sent representatives to Minneapolis for a firsthand look at the General Mills machine.

► **Nearly Automatic Factory**—Autofab is the key unit of five associated machines now in various stages of development. Jointly they will prepare components, assemble them on a printed board, do final assembly, test all circuits and then pack it in protective shells—fully automated.

Autofab itself consists of a battery of 16 component attaching units (24 in the IBM model), each of which installs a single type of component. (The type of component installed at each station can be changed quickly and easily by substituting a new plowment head.) Printed circuit boards, loaded in a carrier magazine, feed out as a carrier under the line of attaching heads.

When the boards reach the proper position, the carrier stops automatically and all heads simultaneously install their contents. The carrier then starts again, advancing the boards one station and the procedure is repeated.

One attaching head is required for each different component to be inserted. Each head is fed from an eight-magnitude turret that rotates automatically when one magazine exhausts its components. This permits re-loading with new magazines without interrupting the line's operation.

Prior to delivering the first Autofab to IBM, General Mills began work on five more units that it expects to complete within six months.

► **Other Key Machines**—The associated machine, which will further mechanize the production of electronic assemblies, includes:

Component preparation machine: Conventional types of components damaged and not their hoppers will come with their leads straightened, cut to size with a tungsten carbide tip and tested in a sequence ready for installation on Autofab. One such machine will be able to handle at least five attaching heads, a General Mills spokesman says.

The first of five component preparation machines now under construction is completed and ready for delivery. Four more are nearly ready to go. Four of these are designed to handle conventional resistor components, such as metal-film resistors, with a wire lead extending from each end. The fifth machine is for capacitors such as paper transistors, which have two leads on one end.

A component preparation machine can handle a small range of different size components without changing the setup. This requires only a quick change of face tool to take a new range of sizes. For instance, the driver might

handle 8, 5 and 1-watt resistors with the one face tool; 2 and 3-watt resistors with another.

► **Dip soldering machine**: This device, being built by General Mills to fit IBM design, will automatically flux, dip solder and clean assemblies. The dip station machine, scheduled for completion in about two months, will handle the rest part from there. Autofab uses:

► **Automatic circuit tester**: Work on this device is in the developmental stage.

► **Automatic end-of-line tester**: Work has not started on this device.

► **Autofab Flexibility**: General Mills spokesman emphasizes the flexibility of the Autofab machine. The present design can be adapted to accommodate printed boards with 210-inch lengths and widths. With minor changes other size boards could be used.

The attaching heads are lightweight (15 lb.), interchangeable and can be located in any station position on the assembly line. The head can be pulled quickly by removing only two bolts.

Components can be mounted flat against the board, as intended. The square-wire-wrap theory, as IBM developed, requires the stand-off mounting of a gold component, one section between component leads and printed board prior to dip soldering. Components can be mounted at any angle on the board, and their leads can be coiled independently in any direction under the board. It is even possible for Autofab to mount components with "twisted" leads in helix spirals closer together than the component body length.

► **Variety Of Components**: Autofab is capable of installing all types of resistors, resistors or rectifiable (lead) resistors, thin-film resistors, pulse transistors, intermediate frequency (now transistors) and integrated or encapsulated junction diodes. Pulse transistors, such as the 2N2222, also can be installed—with due respect for their polarization.

Although the IBM Autofab did not require mechanized installation of power transistors, they would present no problem, a General Mills spokesman says.

► **What It Costs**:—Although the cost of an Autofab will vary slightly with user requirements, General Mills has established the following approximate prices:

- Ten-Head machine, \$39,000
- Twenty-Head machine, \$54,000
- Thirty-Head machine, \$69,300
- Forty-Head machine, \$70,600
- Sixty-Head machine, \$83,500

These prices include components and printed circuit board holding magnetic fixtures at quoted at six to eight months.

A component preparation machine, capable of serving at least four place sites heads, will sell for approximately

\$16,000. The automatic dip-soldering machine, also to serve three Autofab lines, will sell for around \$15,000.

► **Inexpensive Start**:—General Mills can put prospective Autofab users on a modest scale by purchasing a five or 10-head line, even if the assembler he wants to turn out requires more than 10 components.

The concept is "recycling." Planted circuit boards could be re-used through 10-head lines, then discarded in the same manner as the original boards. The boards can be cleaned and the boards run through the line again where up to 30 new components could be installed. Changeover over a 10-head line should take no more than 30 minutes.

To enhance further the versatility of Autofab for small production runs, General Mills plans to develop multi-component placement heads as a second electrical line, a punch card programmer. This would permit various changes and recycling at a small cost.

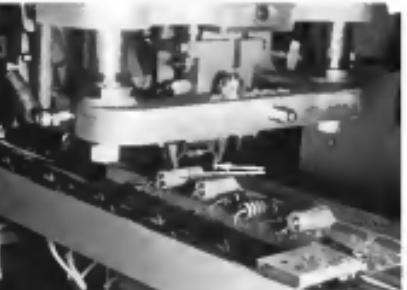
A company analysis indicates the present standard lead change will be more economical than the present multiple-head solutions of a 24-head

line of the production run estimate 160 sets.

► **How They Got In**:—Stanley who leads General Mills as the world's biggest floor-cutter sales is regarded as the entry into automation. Autofab was developed by the company's Mechanical Division, based in the 1920s to develop automotive floor packages. Since World War II, the division produced precision military instruments and components.

Since the end of the war, the Mechanical Division and its ongoing research and development department, have expanded their activities in the aviation and space field. The division currently builds the penumatic hoist used in the B-47, and the R&D department does work in fire control, basic guidance, micromotor and interlocking.

► **SRI Influence**:—ERD is headed by Dr. Charles Brattin, who came to Gen. Mills from Stanford Research Institute, where he was the associate director. At SRI Brattin was close to a USAF-sponsored program to study and develop techniques for mechanized assembly of electronic equipment. This



CLOSE-UP OF AUTOFAB plow-type head (top) shows ingested component (arrow) which permits stand-off type mounting on printed circuit boards shown below.





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A MESSAGE TO AMERICAN INDUSTRY • FOURTH OF A SPECIAL SERIES

FINANCIAL AID TO HIGHER EDUCATION

Our Colleges and Universities Are Living on Borrowed Time

... time borrowed from underpaid faculty members

The chart on this page tells a story of profound importance to every American. It is the story of the financial losing our college and university faculty members have been taking in the past 16 years and posterior years.

On the whole, this span of 16 years has been one of great and growing prosperity. But, as the chart shows, our college and university faculty members have, as a group, had less than no share in it.

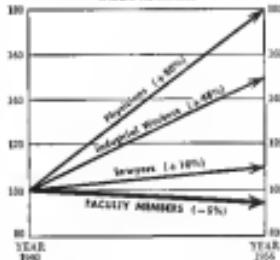
During this period, from 1940 through 1956, the real income of the average industrial worker (that is, what his wages would purchase in goods and services) has increased by almost one-half. Among professional groups, physicians have enjoyed an increase of about 80 per cent in their real income. Lawyers, far less favored financially, have had an increase of about 10 per cent. But faculty members have not only had no increase at all; over these years of prosperity their average real income has fallen by 5 per cent. These figures do not take account of the increase in taxes since 1940.

Senior Teachers Hardest Hit

These figures are, of course, averages. For some groups of faculty members it has been better; for others worse. It has been particularly

bad on senior faculty members. Between 1941 and 1953 their salaries lost about 8 per cent of their purchasing power. Being deeply committed to their cause they could not respond to alternative employment opportunities as readily as could their junior colleagues. For junior faculty members there was some increase in real income between 1941 and 1953 but only about half as much as the average for the nation.

What's Happened to College Faculty Salaries*
INDEX (1940=100)



* Real income after taxes.

SOURCE: Council for Financial Aid to Education; U. S. Dept. of Commerce; U. S. Dept. of Labor.

Public Colleges Fare Better

There are also marked differences in the average financial reward received by faculty members in different types of colleges and universities. A recent study by the Council for Financial Aid to Education indicates that, in the last academic year, 1953-1954, teachers in privately endowed, independent colleges and universities were paid an average salary about \$10,000 less than that paid to faculty members in non-endowed institutions. The same study indicates that salaries far below the average are especially common for faculty members in the small private liberal arts colleges. This study found that during the last academic year the average salary of all college and university faculty members was about \$4700.

The special difficulties under which the independent colleges and universities, and particularly the independent liberal arts colleges, are laboring to get back on their feet financially have been discussed in previous editorials in this series. These difficulties underline the need of special help for these institutions to which business firms are now contributing in increasing volume. However, the problem of providing better salaries is not peculiar to any particular type of institution.

Faculty Members Not Greedy

It is not easy to prescribe a precise standard of fair pay for college and university faculty members. This is partly because they put less weight relatively on money rewards than they put on rewards of scholarly accomplishment and prestige. Consequently, they have consistently been willing to work for very modest salaries in relation to the intellectual ability, education and application required. Obviously, however, it is the dictate both of fairness and good judgment to see that faculty members are given a roughly proportionate share in the general prosperity. Indeed, their crucial role in our society could be made to justify a larger share than this.

There is no way to know with any degree of precision what the underpayment of our college and university faculty members over the past 14 years has actually cost the nation in terms of reduced quality of intellectual performance of those institutions. One reason is that the damage has been minimized by the devoted services

of many faculty members who have loyalty stuck to their jobs in spite of the great financial disengagement.

It is obvious, however, that, if no grave deterioration in the intellectual performance of our colleges and universities has occurred so far, it is because we have been living on borrowed time. It is time borrowed from faculty members who have, in effect, been subsidizing these institutions by their financial sacrifice. This arrangement is not only a menace to the cultural and intellectual life of the nation; it is also a menace to our national security in a time when successful national survival may well depend in peculiar degree on the full development and utilization of our intellectual resources. We depend on our college and university faculties pre-eminently to provide this development. Adequate financial reward for such service is an elementary form of national insurance.

Many of our colleges and universities are working hard to improve the financial lot of their faculty members. Business firms are also playing an increasing role of providing the necessary financial assistance. The methods being used by business for this purpose will be the subject of another editorial in this series. However, vastly more must be done, and quickly, to stop the financial bleeding being taken by our college and university faculty members if the nation's welfare and safety are to be properly protected.

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LETTERS

Gen. Weyland's Book

In the Washington Evening edition of Feb. 7 issue (p. 12), you talk about Air Force interest in getting Department of Defense to review the book written by Gen. O. P. Weyland. I would like to call your attention to specific details which are included in the book.

For your information and the information of your readers, Gen. Weyland has set aside a book, "A Study of Article 125," to review the status of the Air Forces in the U.S. and to assess the future of the Air Forces in the world. He has appointed Gen. Weyland, through his Headquarters, if he would be interested in writing a book about the Forces air war. Gen. Weyland indicated he would be interested providing the idea was approved by Headquarters USAF, and the Department of Defense.

The book will be published by the publishers, Air Force, and Gen. Weyland would like a "final" manuscript containing

the status of the rate of the air forces in the known as we see it by the who commanded the forces throughout the war.

There would be a study of the present situation of tactical and strategic aspects of the war in the air. Special ranges and study would be given the roles played by other services in the combined theater strategy. This is the exact statement that appears in the official correspondence between the two.

R. E. ALLEN
Regional Counsel, USAF
Division of Information Services
Department of the Air Force
Washington, D. C.

(Editor's note: Both the offices of Fred Slatton, then American Secretary of Defense for Public Relations, and Gen. Allen were quoted in *Airline Week* and news media stories of Gen. Weyland's interest in writing a book on the status of aviation. Neither office nor the other provided the information supplied by Gen. Allen and after publication of the item, *Airline Week* is sorry it disrupted Gen. Weyland's privacy. Details about the study of the Forces air war should be told to the Asian area people well-qualified Pentagon correspondents.)

Naval Decision

The ANDS plan of action described in *FAIRCHILD AIRCRAFT* (March 19, p. 18) states that VOR-DME leaders are getting up. Thank God they are not.

It difficult to conceive that the existing Common System would be accepted as free of them, which at present would be used and unreliable. The "consensus" report to ANDS' air safety committee clearly states: "The Common System requires no reliable and continuous engineering of both ground and airborne units is necessary."

The consensus also argues that "Team" cannot be expected to assist the reorganization for two way voice communications with aircraft.

In addition, the consensus said: "Reliable working air plan for widespread use of Team, it would be necessary that the youth-

ies of engineers with other aviation in the 99% to 125% band be carefully studied and evaluated."

We believe that potentially everyone in civil aviation, including many AIA members, will not give up but will fight hard to maintain the powers already granted by DME and VOR.

LAWRENCE F. ZIMMER
President
General Aircraft Supply Corp.
Detroit, 5

ANDB Decision

According to the Detroit News February 26 and February 27 editions indicate at least two congressional investigations into the ANDB decision are underway, and that the General Accounting Office is in the job.

What this shows is pattern from the days when we were looking in Washington, we are now looking in Congress. At the time *Airline Week* reported only parts of the ANDB were released, there was much, then dropped the whole thing like a hot potato.

Is it possible that *Airline Week* has lost the ability to cover how to dig out all of the facts in a reasonable as long as the case, and report them properly?

JAMES BARRELL
President
Northwestern
Aeronautical Corp.
Aurora, Pennsylvania

Airline Week reported the congressional investigation of the DME-TACOM case (see cover, March 7, p. 14 and on March 14, p. 279). *Airline Week* was the first to reveal the VOR-DME controversy and passed a detailed report on Tacom Dec. 7, 1953, p. 49 (Ed.).

Slopeline Lights

J. M. GARY FERSON's letter to the editor of *Airline Week* in the Feb. 11 issue of *Airline Week* is most worthy of note to those of us interested in aircraft lighting.

Everyone naturally hopes to have his child grow up to be a sort of powerful designer as developer of the Slopeline system, in an hopefully research intensive manner.

But let's not forget that there is a good product (in this case the Slopeline) that is a good product of the consumer (in this case the pilot); don't feel it is a good product and if a better competitor is produced (in this case the Center line system) it is available at the best cost.

Let's not forget that Captain Baldwin was highly qualified. What Captain Baldwin wrote may have been exclusively his own words, but it is an opinion shared by thousands upon thousands of pilots.

While Mr. Ferson speaks of thousands of hours of flight, he neglects to realize that the Slopeline is not just ground illumination to the tail and final part ground-based operations, under actual conditions. A few test flights are insufficient considering that experience gained in years of day and night operation putting the lights in position of maximum effectiveness.

The Captain's opinion has been expressed as both the author and editorialist steel and short as staff speaks for the service merits of the two systems.

It isn't a case of a few new setting them

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Lawrence F. Zimmer, President, General Aircraft Supply Corp., is shown working at his desk. In the background is a large piece of equipment used in quality control.

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LETTERS

serves up against the Republic. It seems to be a case of the Transoceanic being forced to take the services of Lockheed.

The name could be set straight on this.

To Meier, Director
Political and Public Relations
Air Line Pilots Assn.
315 West 57th Street
Chicago 19

VFR Traffic Law

It was gratifying to note that you published my letter of Dec. 13. If a straightforward answer to your question is all that you desire, then at least some legal good has been done.

I am, however, dissatisfied with two items. First, you omitted the last paragraph, the first sentence of which was of no consequence. Nevertheless, the remainder was important. Second, you did not point out again that the VFR pilot had some legitimate reason for not doing so.

I do feel, however, the suspense left over that I mentioned in my original issue back is not the case, and reduces a considerably less tension. Any statement of true fact and personal conviction should leave a less tenuous.

A. G. White, pilot
Executive Officer
Bendix Aviation Corp.
Pulaski Field
Detroit 2

Gobien's Note: While in "AGW", the executive pilot whose comments on the VFR profile had appeared in the Jan. 17 issue of Aviation Week p. 110, following is the portion of his letter personally annotated: "Well, that little quibble aside, you're right. I think the specific points you made are to me. I thought the question, but I didn't know what to do about it. I think the answer that you have may be called to the attention of the FAA and the general public. It affects everyone who travels by air."

Flap Retraction

In your Feb. 7 issue under Industry Observers, mention in the second paragraph that "some pilots are plagued for a safe safety device that will avoid generation flap retraction."

We wish to advise that our new Special Control Instrumentation board, an improvement of the old model, would have immediately relieved the problem of safe flap retraction. Any aircraft equipped with it would have the ability to generate a safe flap retraction with greater load off and 135% voltage regulation, far example.

This concept of retraction lift ratios was reported by Aviation Week in the May 21, 1953, issue (p. 67).

This instrument principle is significant because it compares and converts lift any and all factors existing wing lift.

R. L. Morris, Jr.
John Morris, Jr.
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AC Spark Plug Division, General Motors Corp., Flint, Mich.



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tegrally compensated reinforced elastomer line the load-carrying section of the connector, which is made up of either unjacketed fiberglass glass or aramid fiber such as M148-1134 Type I or Type III can be handled without leakage, according to maker.

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Ansoflex Rubber Co., 2818 Cam St., Long Beach, Calif.



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stated weight of 475 lb. The device meets military specifications for airborne equipment, the maker says.

Wichita Gear Works, Lynwood, Calif.

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Insulated terminal, called Thermogard, is designed for operation in areas where temperatures approach 450 F., such as for alarm systems. Monolithic pickup is said to be oil and moisture resistant to most oils and chemicals it encloses. Metric MIL-T-7595A—Bendix Engineering Co., Inc., Norwalk, Conn.



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AVIATION CALENDAR

- Mar. 21-Judicature of Radio Experimental conference, Wilder/Aerospace Hotel, Kosherless Avenue, New York
- Mar. 29-Apr. 3-American Society for Metals, with Western Metal Symposium and Congress, Fox Plaza Auditorium and Ambassador Hotel, Los Angeles
- Mar. 31-Apr. 1-International Conference on Boundary Layer Effects in Aerodynamics, Britain's National Physical Laboratory, Teddington, England
- Apr. 4-6-National Fluid Power Assn., inc. and annual meeting, Broadmoor Hotel, Colorado Springs, Colo.
- Apr. 5-7-Radio Technical Committees for American Radiotelephone and Point-to-Point meeting with the Institute of Radio Engineers, Los Angeles
- Apr. 13-15-American Society of Lubrication Engineers, 10th annual meeting, Ward Sherman, Chicago
- Apr. 14-15-American Defense Assoc., reorganization of Future Combat Information Committee, British Air Force Base, Farnborough
- Apr. 15-20-American Association of Airport Executives, 1959 annual convention and business meeting, Hyatt Regency Hotel, Tucson, Ariz.
- Apr. 16-21-Society of Automotive Engineers, Commercial Vehicle and Material Handling Products Forum and Aircraft Engineering Division, Hotel Butler and McRorys Hotel, New York
- Apr. 18-25-American Society of Mechanical Engineers, Diamond Jubilee spring meeting including four session sessions, Las Vegas Hotel, Nevada
- Apr. 19-22-American Rocket Society, spring meeting, Reference
- Apr. 27-29-Society for Experimental Stress Analysis, spring meeting, Ward Sherman, Los Angeles
- Apr. 27-29-American Helicopter Society, 11th annual forum, Hotel McWayne, Worcester, D.C.
- Apr. 28-29-Military Astronautical Conference, University of Michigan, Ann Arbor
- Apr. 29-May-International regional meeting of Institute of Navigation, Fleetwood Airport, Baltimore, Md.
- Apr. 29-May-New England sub-climate meeting sponsored by Boston and Connecticut sections of IEEE, Sheraton Park Hotel, Boston
- May 2-5-Society of Automotive Engineers, regional conference, Hilton Hotel, Ft. Worth
- May 4-6-Fourth International Aviation Trade Show, 9th Regiment Armory, New York City
- May 10-12-Association of New England College Flying Clubs, annual mid-collegiate air meet, Troy (N.Y.) Municipal Airport
- May 16-20-National Materials Handling Symposium, produced in Clapp & Polk, International Amphitheatre, Chicago
- May 21-24-American Society for Quality Control, ninth annual convention, Hotel Statler, New York, New York
- May 26-27-International Aluminum Institute seminar and ENNVEL Royal Netherlands Aluminum, 8th International Alumina Display, Vredenburg Aeropodium, The Hague

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AIR TRANSPORT

Congress Retackles Navigation Systems

Three committees mix in debate over merits of Tacan vs. civil DME. Military cites defense requirements.

By Freddie Stover

Congress apparently is going to decide again whether there will be a common civil-military short-range air navigation system and, if so, which one—Tactical Airway or civil VOR/DME.

These two Committee investigations are undertaken simultaneously. The recent Air Navigation and Development Board's decision to substitute the Tacan source for the previously agreed upon VOR/DME system, coupled with the investigations already under way at the behest of a fourth Congressional group getting into the act and a pending proposal in the Senate for creation of a special joint committee to conduct a full-scale investigation into the controversy.

► **Congress Papered**—Likelihood of establishing a pilot committee, which was proposed in Sen. Styles Bridges' bill to codify existing law, however, has been relieved by the Senate Armed Services Committee, which cut it from its bill to reauthorize the civil-military navigation system.

Other changes that would be hard to stop at this point are being considered by a House Commerce subcommittee and the Military Operations subcommittee of the House Government Operations Committee. All of these groups are working independently of each other, possibly at odds, perhaps.

First to hold hearings was the House Government Operations subcommittee, headed by Rep. Chet Hulick. A closed-door meeting with military air armament and field M&E [A] staff later this fall was the only public session to date was called.

► **Going To Trial**—On Feb. 1 Chet Hulick set the timer for the hearing when he stated his purpose was to determine if Tacan was a "wise" procurement. "We're going to find out if that [Tacan] is a better radio than that one for which \$117 million has been spent and going to just." Hulick said. The question is raised, he said, because Tacan has not yet been proven to be reliable but there has been production contracts for both the system still in the research and development stage.

First witness for the Defense Department was Donald A. Qualls, Assistant Secretary for Research and Development, who defended the military's as-

sists in developing Tacan and the ANIDB decision to make it the common system.

His testimony was supported by Air Force Assistant Secretary Trevor Gadd and Cmdr. R. P. Lewis, Navy chief liaison, who also were on the panel. Lt. Col. John F. Tamm, from the Air Force's Defense Communications Division told the committee the deficiency of VOR/DME for military applications was well known since knowledge as far back as 1947. He said he thought the position was justified in going ahead with its simple system because of a very real need for technical equipment. Tamm wouldn't be advised, however, for consumers to become of Tacan, he claimed, but acknowledged that declassification is now in process.

The ongoing discussion, Qualls said, to switch out and swap with VOR/DME was made solely by Civil Aviation Administration. "There was no congressional tackled with CAA," he said, "and they were given the go-ahead." However, he noted, the DME portion of the civil system has not been generally accepted by the aviation public. An example cited in Detroit is reflecting the lack of importance of DME to the airlines was the fact that they haven't thought it necessary to purchase and install the equipment even though the CAR 4000 equipment was being installed.

The ANIDB decision this year to proceed with development of Tacan for civilian use as the common system is in the public interest because it promotes a more expandable common civil-military system from VOR/DME, according to Qualls. He said those same reasons for taking the change are:

► It will be the least costly to the taxpayer.

► It best satisfies the needs of both national defense and civil aviation.

► It requires further expenditure for equipment already bought within.

► VOR Procurement—Three Gardner and the Air Force has an equal large investment in both VOR and Tacan. But he said, "VOR will be obsolete well 1955 and by that time all use will have been made of the equipment and we'll have gotten our money's worth."

The Air Force's total cost of VOR, as reported by Gardner, has been for 24,000 sets of which 24,000 have been received and 10,000 installed. Out of

Tacan History

Chronological history of Navy contracts areas for Tacan development, evolution and procurement.

Date	Action
June 1945	Development contract to Federal Telecommunications Laboratories for one aircraft and (ARM 16) and one surface unit (USN 11).
June 1946	Development contract to Federal for ARM 17(UN 1) and USN 12(UN 1).
June 1949	Development contract to Federal for ARM 18(UN 1) and USN 13(UN 1).
Dec. 1950	Contract to Federal for 18 radio link models of ARM 13(UN 1).
July 1950	Delivery acceleration, including evaluation, to combatant contract.
March 1951	Delivered to Federal for ARM 19(UN 1) and USN 14(UN 1) after evaluation.
May 1951	Letter of intent for production issued to Federal Telephone and Radio Co.

► **Decommission**—Production contract to Federal, Inc. of Atlanta for subcontract to Standard Electronics and Electronic Laboratories.

September 1951
Typical delivered first of 40 ARM 21's, 21 1/2, Atlanta at succeeding monthly rates.

May 1953
Federal delivered three CRNA pilot run models.

January 1954
Federal began delivery of production ARM 17(UN 1) total of 400 sets required for production.

February 1954
Production contract with Federal for 2,012 ARM 21 sets.

August 1954
Production contract with Standard Electronics for 1,612 ARM 21 sets.

September 1954
Production contract with Federal for 675 ARM 21 sets.

October 1954
Production contract with Hoffmann for 2,175 ARM 21 sets.

January 1955
Federal began delivery of first 50 UN 16's.

March 1955
Production rate for ARM 31 at 80 sets/month scheduled for a cumulative total of 1,115 per month by August or September.

Tacan Contracts

Following production contracts for Tacan equipment, both airborne and surface units, have been awarded by the Navy to three manufacturers.

Airborne Units (AN/ABR-21)

Contractor	Value	Units	Source
Federal Telephone and Radio Co.	\$10,349,455	1,100	Navy
		1,104	USAF
		437	MDAP
Total	\$10,349,455		
Federal Telephone and Radio Co.			
Schleichers Inc.			
Standard Electronics Inc.	2,302,464	250	Navy
Hoffman Laboratories	2,191,263	250	Navy
Stromberg-Carlson, Inc.	38,615,386	1,540	Navy
Hoffman Laboratories	24,178,232	250	Navy
		1,285	USAF
Sub-total	\$94,204,000	9,252	

Surface Units (AN/UBN-4)

Contractor	Value	Units	Source
Federal Telephone and Radio Co.	62,726,692	202	Navy
(Special design)	2,118,000	420	USAF
Total contract value	\$85,844,692	625	

Research and Development

Contractor	Value
Federal Telecommunications Laboratories, Inc.	20,725,252
Total contract value	\$112,788,792

the total \$6,000 the Navy has received of \$100 acts through the Air Force with another \$60 programmed.

The cost of Tacan is due for the Air Force to be averaged at \$1,500 each, exclusive of installation costs which includes more than 3,000 airborne and surface units. Gardner commented that funds from the financial interest in the Tacan program for Air Force has a direct impact on its assigned responsibility for continental defense. This assignment for USAF interest in some of the tighter specifications of the Tacan system, he said.

► **Missouri Step-Gaines and Quisenberry** agreed that Tacan has not been performed as well as it could be in the past due to a number of problems. Holifield cited Congress. "Why not a research and development contract for some 400 units instead of a production contract for 6,000?"

Gardner replied, "It is necessary to put such units into production before they're made. If we wait for final development as it stands, and this includes the B-58, vapor system, what have you, we will be hopelessly behind the enemy."

"We will be continuing to develop Tacan for the next few years. That goes on in every one of these process areas, if not suggests to show in the process."

Cale Morris, National Business Aircraft Arms representative, said:

"Do we have or have we ever had the concern system which Congress and the civil user thought we had and for which Congress appropriated large amounts of money to implement?"

Morris added: "If the military can't learn on the Concourse System, an incompatible tactic system, which it has already developed, which has been considered through the proper channels such as AGC or ANBDA and thereby denies the Government Services which has been conducted, accepted

and agreed to in these same agencies by the same military representatives, then our domestic form of government is in jeopardy."

3-Cent Airmail

• **Post Office wants service post on permanent basis, cites \$154,000 saving.**

Post Office Department estimates a saving of \$154,000 in air mail through the air shipment of first-class three-cent mail as an experimental trial and wants to continue the service as a "permanent basis," according to Postmaster General Arthur Sulzberger.

He estimated that the General Accounting Office audit, now underway, would assess the department's estimated annual "unnecessary" excess.

► **Court Action**—Post Office has requested Justice Department to appeal the decision of U.S. District Court Judge James Kirkland that the transcript of the two cost mail by air as a permanent basis would require amending legislation. However, Judge Kirkland denied the petition of the Post Office, reasoning that the postmaster had authority to experiment so long as the test period did not last too long (AW, Feb. 14, p. 180).

If the appeal is accepted, the case will be heard in the U.S. Court of Appeals for the District of Columbia.

"If we find it necessary, we certainly are going to ask for legislative assistance" to continue the air shipment of three-cent letters on a space-available basis, Sulzberger told the House Appropriations Committee. "Because, finally, we consider it not only in our nation's interest, but as a part of our defense and military programs, we feel it is essential that we be permitted to pursue."

Referring to air mail operation to the air shipment of surface mail, Sulz mentioned:

"That stuck to be following in the footsteps of the people that provided that in the handling of mail as far as old days by post experts and who, at times, resisted my change because they lost revenue. . . . And apparently the railroads are concerned because they probably know what we know, that the public having seen the improved service might want it continued."

► **Two choices**—He explained that "the methods for removing their mail carrying trains from their schedules and finding them to be off routes of transport" and the same firms are trying to sustain us from expediting in the movement of mail by air."

In issue, Sulzberger declared,



Richard Conwell,
Postmaster General;
Peter Blatt, Aerodynamics
Division head (seated);
and Irving Lissner,
aerodynamics engineer and
boundary layer control
specialist, discuss effects of
boundary layer lift on aircraft
control on left aerodynamics
and pressure distribution.

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1. Estimate improvements in maximum lift of sweptback wings with boundary layer control for use in future commercial transports
2. Evaluate maximum speed and altitude capabilities of advanced supersonic military designs
3. Determine ability of vertical rising aircraft to make transition from horizontal to vertical flight
4. Estimate direct operating costs of new turbo-prop commercial transports under various types of operating conditions
5. Determine air load loads on turbo-prop cargo airplane for all types of engine failure
6. Determine ability of new trainer to make current landings and catapult take-off
7. Establish design criteria for auxiliary damping servomechanisms on future fighters
8. Optimum approach and landing techniques for use on rough, short fields by rescue aircraft

Career-oriented Aerodynamics Engineers and Aerodynamicists are invited to participate in this expansion program. Address inquiries to E. W. Des Lingers, Dept. A-3-3.

LOCKHEED
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we are faced with one of two choices: "Put the road at the air or put it on the already congested highways in the nation."

Other points made in Sunbeamfield's testimony were:

- Cost of several transportation will be slightly higher in Fiscal 1956 (\$54.4 million) than in Fiscal 1955 (\$53.8 million). The cost for domestic aerial transportation is expected to rise from \$10 million in fiscal 1955 to \$19.8 million in fiscal 1956, and for foreign aerial transport from \$14.3 million to \$14.6 million.

- This compares with \$10 billion for rail and transportation in Fiscal 1955 and \$13.6 billion in Fiscal 1956.

- The domestic aerial vehicle is expected to increase 4.5% in Fiscal 1955 and another 5.3% in Fiscal 1956.

- Domestic aerial revenue is estimated at \$13.7 million for Fiscal 1955 and \$14.5 million for Fiscal 1956.

- The departmental loss approximately \$600,000 annually by shipping mail on foreign airways at Commercial Postal Air rate, substantially higher than the mail rates paid U.S. international carriers. "For diplomatic reasons," Albert Robinson, Assistant Postmaster General, said, "we believe it is preferable to continue the use of domestic carriers."

House Committee Cuts Subsidy to \$5 Million

Civil Aeronautics Board's request for \$15.2 million to finance subsidy fee payments for the remainder of fiscal 1955 was cut to \$5 million by House Appropriations Committee with crucial comments concerning the Board and Pan American World Airways.

Despite vehement testimony by CAB Member Clark Connor on what may have sharply reduced labor representation, the committee, in making the

Reconfirmation

The continental coordination rule has been rejected by a small vote of the smaller airlines of the Air Traffic Conference. The vote, after the June 15, leaves coordinated routes free to continue the rule or drop it at their discretion.

Opposition to the rule has grown over the past months as the union problem, which it was supposed to solve, remains as bad as ever.

American Airlines, which led the fight against recoordination, says it will propose a plan at the May meeting of the Conference calling for a "reasonable policy" to be imposed against recoordination.

\$39.2 million reduction, had these two components:

- First, the Board's \$12.2 million request does not reflect reductions from application of the Supreme Court decision last year establishing the so-called offset principle under which earnings of an airline are to be applied against losses on another division.

At hearings, Connor said that there is only one possibility: Trans World Airlines on which the application of the offset principle "could" have an effect on fiscal 1955 and fiscal 1956 subsidy requirements. His testimony, however, was at odds with the Board's.

- Second, the Board estimates that TWA's domestic and international divisions will both be subsidy free in three years, leaving nothing to offset. But, if the Board's decision on the service mail rate for TWA's transoceanic operation should develop a requirement for subsidy, the Board believes that domestic savings would be sufficient to offset that.

Possible refunds to the government as a result of the offset principle, Connor repeated, involve the operations of the carrier for three years prior to fiscal 1955.

In addition, the committee objected that the Board had established a safety factor of eight for Pan American. The committee quoted the finding of its investigation staff that "most of the subsidiaries have never been properly integrated and some not at all, and there has not been evidence that the operations of the entire PAA system have functioned as an entity." If supervisory audits were taken, integrated entry in subsidy would result.

Defending the Board at committee hearings against attack from Rep. John G. Connelly, former CAB chairman, Connor responded that CAB had had a total of 10 investigations of PAA's safety record, and that, although further passenger traffic analysis would attempt to cut costs, it was added.

CAB's estimate of a year ago was that \$7.7 million in new money would be needed in fiscal 1955 to finance airline subsidies. This has been reduced to \$4.7 million to \$5.5 million in these discussions.

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Opposition to the rule has grown over the past months as the union problem, which it was supposed to solve, remains as bad as ever.

American Airlines, which led the fight against recoordination, says it will propose a plan at the May meeting of the Conference calling for a "reasonable policy" to be imposed against recoordination.

Titanium Airlift

Rock Airways now is operating a modified version of its own truck-air-truck cargo system.

The 100-ton live fire titanium ingots, shipped by truck from Hanford, N.M., to Los Angeles, to Pittsburgh where final delivery to Brookhaven, Pa., is completed by surface transport.

The second route, up to northern Titanium Works in the West and Alphayco Lathons in the East, takes an estimated 16 hours for each delivery and costs approximately \$15.00 per 100 lbs.

the East and Consolidated Freightways of Portland and Western Truck Lines of Los Angeles in the West.

Rock will charge approximately \$19.50 per 100 lbs for its door-to-door service, compared with \$35 for regular air-freight. Minimum delivery time will be 90 hours between metropolitan centers overnight service is provided.

- Increased Volumes—The truck-air-truck service would be available to all 20 cities on the scheduled cargo line's network.

Routine managing the volume of aircraft-readying Slick to further reduce rates which are currently one-third of air-freight rates, based chairman Delos W. Brantley, says, "The truck-air-truck system will enable us to operate seven days a week instead of on the present five-day schedule. It will open up on a large scale for the first time the transporation by air of household articles, at approximately the cost of ground ground transportation."

- Bright Outlook—Pan American-Brazil predicted the overall freight business will expand at a revenue volume equal to and possibly greater than, reflected in current passenger traffic growth trends, strength in our cargo rates.

He says new freight will reduce the cost of freight even further.

- Outlook—Douglas DC-6A operates at 10 seats a cargo lane, compared with 15 to 16 for the C 46s," he says. "Loadings of turboprop C-130A would bring the operating cost down to 6 cents per mile."

"And later series of turboprop cargo transports will cut this cost to 5 cents."

- Turboprop DC-6A—Brazil's position of turboprop transports operating cost is not to be affected by aircraft selection as it had to do with USAF aircraft on terms similar to the DC-6A rental rate up between the Nas and Shiklak area (AW Feb. 28, p. 13).

The airline can already lease L100 with two turboprop transports on a long-term basis," he says. "We could hold them in reserve and make them available to the military on 45-hour notice."

Pilots Shy at Reporting Flight Incidents

- ALPA safety forums told lawyers abuse reports; poor airports, also, are hazards.

By Gordon Cooley

Chicago—Two big blocks to the same safety role in air transportation are accident-prone airports and Civil Aviation Administration's new barriers to safety of pilots. Strong members of the Air Line Pilots Assn. and other flight crews are telling.

"The message is how to keep from being killed," commented one pilot. "But when I report an incident to make sure it doesn't happen again, they say it doesn't happen again, they say it's not a CAA attorney changes me with a violation."

- Most airports don't come up to safety standards," said another ALPA member. "As a matter of fact, much airline training is just a chance to makeup for unsafe airports."

- Industry Effort—The two pilots started up the present feeling of steady CAA defensive aviation industry representations and flight safety experts of the three-day forum held here Mar. 5-10.

The forum also invited pilot training wings, all weather flying programs and problems of automation from transoceanic powered by power engines to turboprop airliners.

Accident Prevention

Most CAA observers at the forum privately agreed that accident prevention was not up but December when the responsibility for enforcing federal flight regulations was shifted from the Civil Aviation Authority to the CAA.

Under the old system, CAA safety experts acted as "federal enforcers" to police and track over accident reports privately to find ways to prevent recurrence.

Now the attorneys can't report for possible violations, asking the pilots reluctant to fly themselves open to prosecution.

- Closer N. Soyer, ALPA president, put it that way. "One of the primary safety functions of the airline pilot is discovering and reporting on safety problems. Anything that interferes with his free flow of this information is itself constitutes a hazard."

- Toward Obstruction—Soyer was supported by John Eddleman, director of the Flight Safety Foundation, who described pilots in the most important

Four-Turboprop Convair

Convair is seeking a new bid for the short-to-medium-range turboprop transport market with an aircraft powered by four Pratt & Whitney R-2800-10s. The original company project engineer J. T. Woods Jr., remained at the Air Line Pilots Assn. Safety Forum.

The new CAA proposal is about the size of the Model 340. But the transport's tail, claimed to be the TC-120 design, is about 12 inches higher and 20 inches wider on each side than the 340.

It would have a range of 1,400 miles and a maximum speed of 310 mph at 13,000 feet. This range would be made possible by using two 2,800-shp top turbines to supplement the integral wing load of 1,600 pounds.

Full payload of the 48-passenger transport would total 14,500 lbs. In will often stations include maximum gross weight, 16,000 lbs., maximum

fuel in reporting dangerous incidents. "But it is not a sensible and understandable abstraction to the reporting of dangerous," the pilot does not want to involve himself in further trouble or in my way goes down by separation or his pilot's certificate," Lauder told the forum.

"This is a very serious situation. It is the result of actions taken by government leaders who feel impelled by their interpretation of the Civil Aeronautics Act to investigate incident reports for the purpose of determining whether a regulation has been violated so that

potent action can then be taken against the responsible person, regardless of culpable negligence, but modern ideas of punishment do not consider that the old concept that punitive measures are effective in converting dangerous attitudes."

- Flight Recorders—As a supplement to pilot reports, Lauder proposed mechanized recording devices similar to those that are currently employed by some railroads and boats.

"Flight recorders, if used as an auxiliary device or as a basis for positive measures, could act as a means to avoid

Simulators vs. Procedural Trainers

An American Airlines observer at the Air Line Pilot Assn. Safety Forum called flight simulation more expensive and slower than conventional training being developed by AA's own.

But a spokesman for United Air Lines, equipped with four of Curtis Wright Corp.'s Dynabars, and the main source of training given by a simulator to the answer to cutting down further or transport fatalities.

W. W. Eason, American's director of flight operations, estimated that simulators cost \$1 million to buy and install plus an additional \$1 million a year to operate, including the cost of jet fuel.

"Our procedure is to develop a developed cost about \$160,000 to 140,000 and month," Eason says. "The operating expense is about 10% of a simulator operation."

"American pilots are limited to 15 hours a month. This means we do not use it enough to justify the higher maintenance of pilots."

Capt. E. Seaton, chief of flight simulator training for UAL, said it would be best to measure the cost of Dynabars against the level of airline passengers—and that is the difference."

"With simulation," he added, "we can find the weak in the keynot that may cause an accident."

Steady travel, however, that United intends to define the cost of its Dynabars by scaling its costs to other airlines. He said UAL is losing 12 extra men to fit in the guys caused by shifting crews to the mandatory training centers.

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Wong said the only opposing dead-weight was the Vincor's high rate of fuel consumption and problems connected with it.

► **Fundamental Difference** — Raymond B. Maloy, chief of CAAN flight test branch, described the fundamental difference between a propeller-airplane aircraft and a helicopter as the latter's "greater speed-height operating regime and the different thrust and drag characteristics of the power plant."

He said the differences create insurmountable problems. Maloy gave as an example climb performance and power plant control.

"None of these problems would be lost in the finalization of appropriate policies governing their nonorthodox aspects," he said.

CAB ORDERS

(Feb. 24-Mar. 2)

GRANTED

Northwest Airlines, a 30-month exemption to allow free transportation by scheduled passenger air to Lockheed Aircraft Corp. and Curtiss-Wright Corp. for purposes of flight observation.

City of Los Angeles issued to interview at the Government City Los Angeles several new.

Southeast Airlines permission to serve Southwest Calif., through the Lockheed Air Terminal.

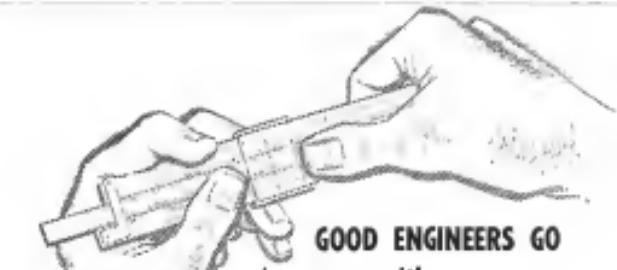
Frontier Airlines permission to serve Minot, N.D., via Chicago via St. Louis Valley Airport.

Delta Air Lines, Lake Central Airlines, Northwest Airlines, Clark Air Lines, United Air Lines, the Chicago Area of Commerce and Industry, the Cuyahoga Rockford Airport Authority and the Portage County Board issued to interview in the helicopter air carrier certificate renewal case.

Midway Airlines permission to serve White Plains, N.Y., through Westchester County Airport.

Tennessee Air Lines an exemption to operate one flight from Atlanta, Georgia, to New York pursuant to a contract with the Inter-American Committee for European Migration. Action on these other Tennessee applications will be deferred. Tennessee is also granted to lease a DC-4 from Eastern Airlines Co. to operate the approved flight.

Piedmont Airlines permission to serve Parma, Ohio, via Maumee, Ohio, Huron, Wood County Airport and Columbus, Ohio, through the Port of Columbus Airport.



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EDITORIAL

Why We Underestimate Soviet Airpower

"You completely underestimate the Russian danger even in respect to technology. Russian work in aviation since 1945 has been completely concealed. Developments come only in the political field. Many western visitors come to the conclusion that Russian aviation is just as poor as their technology in the civil sector. This is not true. The poor tool technology is actually a consequence of the Russian concentration on military technology."

An "underestimation of the Russian technological advances" is to be expected since they are getting more young technicians and scientists who have been well educated and trained.

This sobering warning was received by Arnevers Wiericke in a letter from an internationally known German aircraft designer who worked in Russia for more than five years. He now lives in the Western Zone of Germany.

This is the judgment of a man who is technically qualified to evaluate modern aeronautical research and development and who has been working in the midst of the Eastern military aviation picture until only a few years ago.

It is a warning that should be carefully studied by the aviators and representatives of the Armed Services and Appropriations Committees as they consider the Fiscal 1959 research and development budget for USAF, Navy and Army aviation.

Unless the United States enlarges its current slim margin of technological superiority over Russian airpower we will be doomed to defeat in another five to ten years. Without the foundation of an adequate research and development program backed by sufficient funds and a sense of national urgency our airpower technology cannot maintain the pace suggested for survival in the atomic "Age of Peril."

North American Shares Superior Data

In the constant struggle necessary to protect its legitimate proprietary rights from encroachment by government officials and military forces with a somewhat eccentric outlook, the aircraft industry is often accused of taking a narrow official view of what should be broad problems of national welfare.

The recent policy of North American Aviation, Inc. on the F-105 Super Sabre accident investigation offers specific evidence to refute this usually groundless charge. North American is a privately-owned corporation operating under the spur of the profit motive in a highly-competitive industry. In the course of investigating the F-105 accident that cost the life of its chief test pilot, George Welsh, its engineers developed comprehensive data on the stability and control problems of supersonic aircraft in addition to that satisfied by USAF and National Advisory Committee for Aeronautics.

North American made this data available to other

firm with which it is competing for USAF and Navy high speed fighter contracts. A detailed report on the F-105 data was prepared and submitted to other companies at request in addition to copies furnished both USAF and the Navy. The Navy's Bureau of Aeronautics, which has no direct responsibility for the F-105 program although it was encountering similar problems on its own high-speed fighters, was particularly grateful for the North American data and so stated to the company. Internal meetings also were held by North American engineers with Conair and Grumman to provide further details on the F-105 data.

This was a North American policy decision stimulated by its engineering vice president, Ray Rice, and approved by top level management headed by James H. Knobellberger, board chairman, and Lee Atwood, president. In explanation of this policy to AVIATION WEEK, a North American spokesman wrote:

"The reasoning back of this action was simply that encouragement felt that if we could give some other company or military test facility free access to full details we should do everything possible to prevent that possibility."

"There is also the very sound thought that it was also of assistance to the defense program in the development of supersonic aircraft."

North American management's decision on this matter has won the admiration of both the military services and their competition when it helped on a problem of vital national welfare. It is irrefutable evidence that aircraft stability can and does place national welfare ahead of personal profit when the occasion demands.

Pacific Wings Club

San Francisco is an area steadily growing in aviation importance. Its magnificent new airport is an international crossroads of the rising airline traffic to Asia and the Pacific islands. Both USAF and Navy aviation have important bases in the Bay area and the high-speed research laboratory of the National Advisory Committee for Aeronautics is only a few miles down the atmospheric "Age of Peril."

Indication of San Francisco's growth as an aviation center is the establishment of the Pacific Wings Club. The group, now in its second year, aims to provide a focal point and facilities for aviation people in San Francisco and the Pacific islands similar to that afforded by the Wings Club in New York. It now has more than 200 members and club rooms in the Sherman-Palmer Hotel!

John Felton Turner of the California Automobile Committee is now serving as president. Among its members are such familiar aviation names as Tom Drosdowski, president of Western Airlines, South de France, head of NACA's Ames Laboratory, and Col. Clarence Young, vice president of Pan American World Airways.

The Pacific Wings Club is off to a good start. It can perform a pleasant and useful function. We wish it well.

—Robert B. Hertz

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